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IN ALL THEIR DEPARTMENTS.

BY A COMMITTEE OF PRACTICAL SURVEYORS, ENGINEERS, AND ARCHITECTS, OF MUCH EXPERIENCE AND IN ACTIVE EMPLOYMENT.

ROBERT MUDIE, LITERARY CONDUCTOR.

REMARKS ON THE SPEECH OF MR. PRESIDENT WALKER,

ON OPENING THE PRESENT SESSION OF THE INST. C. E.

JAMES WALKER, Esq., holds a high and honourable office, and one which should influence, stimulate, and encourage Engineers from one end of these islands to the other. He is President of the Institution, the only body in which the profession can be brought en masse before the public of this country, or before the world generally. In the discharge of the duties of his office, he is remarkable for his suave bon-hommie, which he can in the most winning manner pour like oil upon the waters of the Institution, when they begin to ripple, and curl, and threaten to run against each other in small conflicting waves. For these reasons he is esteemed by the full-grown, and beloved by the striplings; and a shade of melancholy is thrown over the meeting if Mr. Walker is not in the chair. In addition to this, he is exceedingly liberal both in his compliments and his cash, and so far as the society goes, he is quite a Mæcenas. But Mr. President Walker would do well to remember—and whether he remembers or not—the world, whose eyes are upon the Institution and its proceedings, knows, that he has higher duties to perform than any thing connected with the mere pleasure or prosperity of the Institution. He is the essence or epitome of British Engineering, in opinion, in word, and in execution; and whatever he expresses, either with regard to the present state of engineering, or to its future prospects, will be taken as the truth by engineers of all countries.

Now there are in his address two propositions, or rather a main proposition and a sort of corollary, which are in our opinion calculated to damp the ardour of engineers, more especially of young ones, who above all others require to be encouraged. Mr. Walker states that "the surveying and execution of Railways caused a great demand for engineers"—if he had said "persons calling themselves engineers" he would have been nearer the truth,—but that the principal towns are already connected by railways, or engineers or surveyors are now employed in projecting or executing lines where they are yet wanted. Is then the demand for professional gentlemen likely to *increase?* Is it not likely rather to *decrease?*" This is the main proposition, which we regard as both mischievous and unfounded; and even though it were true, we think the promulgation of it by such a man in such a place would savour but little of "absolute wisdom,"—as it is, it is "wisdom" in what grammarians call the "ablative absolute"—no direct action can be grounded upon it.

Having delivered himself of this piece of sapience, Mr. President Walker goes on to enumerate the various sources whence a great increase of engineers is to emanate, deluge the land, and float away the present race on the wide waters of oblivion. There is a sort of snake in the grass here; but as that may be a Coulacnonara, or Bush-master, and we have not the nerves of a Waterton to grapple with either of these fanged and hissing gentry in his den, we shall let the reptile repose in peace. The source whence this increase, according to Mr. Walker, is to arise, is "the classes for civil engineering at the different Universities and Academies; the Universities of Edinburgh, and of Durham; King's College, University College, and the College for Civil Engineers in London; we are led to ask, Will this country find employment for all these? I freely confess that I doubt it." By some strange oversight Mr. Walker has left out in this enumeration the very college which we are inclined to think likely to produce the best engineers,—namely, the University of St. Andrews, where there is more real education and less trickery and pretence than at most of those which he has enumerated.

But independently of this omission, it appears to us that the view taken by Mr. Walker betrays great ignorance on the subject. To attend a class for Civil Engineering, or even a college which professes to be wholly devoted to that subject, will not make the student an engineer. It is merely a part of general education; and we look upon it as one of the most important branches—one without which no system of education, professing to be general and liberal, can be complete. If the members of the House of Commons were all thoroughly versed in the principles of Engineering, many a foolish work would be prevented, by the refusal of an Act for carrying it into execution; and if the schemers and directors of Railways had possessed but a smattering of knowledge upon this subject, many millions of the cost would have been saved, and available for the execution of other improvements. The classes and colleges have therefore very little to do with practical Engineering any farther than as they may make the man who becomes an engineer a little more at home in his measurements and calculations than the majority appear to be at present. In this, however, the effect will be much less beneficial than those who are sanguine about it are apt to suppose; but to such of the people as may avail themselves of it, the gain will be unspeakable. It will enable persons to understand their localities, to find out the improvements of which these are susceptible; and, in the event of their being carried into execution, of seeing that the plans and the work are what they ought to be. We have given the Railways as instances where the total want of information on the part of the public has allowed countless jobs to be done, and expensive works to be badly planned, and worse executed. But if we examine other public works, indeed we may say all public works, except where the Engineer has been imbued with a love of his profession, and a zeal in the execution of it which we cannot look for in many instances, we shall find evidences of the bad effect of this general ignorance. The Caledonian canal by Telford, and the harbour at Sheerness by Rennie, are striking instances of this, though these gentlemen were the best engineers of their time. Indeed, in every public work which has been remarkably well constructed, we find

there has always been some superintending head intermediate between the chief engineer and the workmen. The early part of the Dundee harbour, planned by Telford and executed under the superintendence—the close and hourly superintendence—of Logan, is a remarkable instance of this. The superiority of execution in that work was not owing to any engineering knowledge on the part of the Commissioners, for they were as guiltless of science as men could be; and when, upon one occasion, Logan gratified their whim by filling up a part of the made ground as they wished, the sea wall was levelled to the foundations, while in all that was filled up by Logan himself, there was not a sinking, a crack, or even a flexure. This last is an instance of mischief done through ignorant interference, and the cases where mischief has been done by ignorant men interfering are very numerous.

From all this it follows very clearly, and indeed as matter of course, that the principles of Engineering, together with as much of the practice as can be learned at such establishments, ought to form part of every liberal education; and that without the slightest reference to the student being a practical engineer, or anything else than an intelligent man, quick in observation and sound in reasoning. When the number of students attending those classes which are understood to be necessary as preliminary to the clerical office are increased, we do not predict that the country is about to be overrun by parsons, and that those parsons, when they are qualified for the clerical office, must run to and fro over the earth in quest of chapels and congregations. It is the same in all the liberal sciences which have a bearing upon particular professions,—they prepare the student for better discharging the duties of these professions; but in other respects they have no bearing upon it. If college classes had this effect, domestic education, and even self-education, would have effects of a similar kind; and the consequence of Mr. Walker's hypothesis would be, that a well-educated population would be constantly endeavouring to elbow each other out of all the scientific professions, quit the industrial arts, and leave the country to wreck and ruin in those matters which support the whole. Now, how stand the facts? Why, it is palpable to the observation of every rational man in the country, that no one science, or practical application of science, can receive any great impulse without having a beneficial effect upon the whole; for, when the human mind is roused to improvement, no matter upon what subject, the awakening of it becomes vital through the whole. Therefore we say again, that classes for Civil Engineering, or the numbers attending them,—and the greater those numbers are the better,—have no tendency to produce a single engineer beyond what the demand of the country requires. It is true that if a greater number were so educated, it would be of great advantage in the case of an extraordinary demand for engineers: that demand would be supplied at once and in an effective manner, and those requiring them would not be driven to the employment of such stuff as they were often obliged to have recourse to in the case of the railways. Though a young man learns the principles of Engineering, does Mr. Walker mean to say that he is good for nothing but being an engineer? As well might he say that a man who had studied Latin and Greek were good for nothing but poring over those languages, or that a geometer or an analyst could do nothing but doze away his time in following out these sciences to their higher departments. In every science, and in every art grounded upon science, there are two consecutive sections: one in which all admits of practical application, and is useful to the owner, both in his profession, whatever that may be, and in general society as a man of talent. Thus, for instance, a very slight glance at this address will convince any one that Mr. Walker is no analyst, for the detached assertions of which it is made up are "all in a heap,"—like the dry bones in the valley without connecting sinews or ornamental flesh; and thus, though we readily admit that he is a man who stands deservedly high as an engineer, yet he would be a great deal better if somebody would trim up his logic, and "mend his cacology."

Engineers, like other professional persons, are not grown like hay in a meadow or turnips in a field. They are called forward by the public demand, and though every man in the country had the school or even the office qualifications requisite for the purpose, there would not be one engineer more than there would be demand for. It is of no use therefore for Mr. Walker to advise young engineers to qualify themselves for all countries, and go

"To Nova Zembla and the Lord knows where,"

in quest of jobs. There is no more harm in the emigration of an engineer than there is in that of any body else; and we are not sure that any great blank would be made though half the M. I. C. E. took shipping for New Zealand to-morrow. But still they would do this at a very great disadvantage. The Engineering required there is very different from that practised in this country, and a clever hand at grubbing up brush-wood, making ditches and fences, constructing log-houses, carrying heavy burdens, and enduring hunger for a day or days in the wilderness, would be of more value than the whole Institution with all its functionaries. Even in civilized countries,—and some countries are so highly civilized that it would require nice discrimination to know whether they are behind or before Britain,—a British engineer would be out of his element at least for a time. Britain is a peculiar country, differing in many of its physical characters from all other countries, and therefore an emigrant engineer would have to study the country before he were fit for undertaking any out-door operation. Thus, in every way that we place it, the corollary of the President falls to the ground; and it would do this, although the proposition from which it professes to be deduced were strictly and demonstrably true. Let us now examine that proposition, for in it lies the gravamen of the whole charge which we very reluctantly take up against Mr. President Walker.

One always understands those subtle matters best by throwing them into a syllogistic form; and the major proposition in this case is embodied in these words:—

"The principal towns are already connected by railways, or engineers and surveyors are employed in projecting or executing lines where they are yet wanted."

"The conclusion is thus stated,—"Is the demand for professional gentlemen likely to *increase?* Is it not likely rather to *decrease?*"

This is a queer-looking sort of syllogism: it has got the major and the conclusion; but it wants the minor which should connect them; and thus it is like a bridge with the two abutments and wanting the arch: there is no getting over it. One, however, very naturally, and indeed of necessity, mentally supplies the copula, which if stated in plain words would be this:—

"Railways are the principal employment of engineers, without which they could not exist."

Now, this is not merely nonsensical, it is absolutely not true; for engineers, and engineers fully equal to the very best that are now to be found, existed, and got employment and honour, before such a thing as a railway was ever heard of: and engineers would continue to exist, though all the railways were at the bottom of the sea.

This minor proposition, which Mr. Walker does not choose to state, but by the omission of which he reduces his whole assertion to nothing, is part and parcel of a narrow-minded prejudice, from which engineers are not exempted any more than other people. It is the old story of "there is nothing like leather," drest up in new phraseology. An engineer makes a good deal of money, and gets some credit for a certain class of works; and this leads him to suppose that those works embody the whole of Engineering.

We say that this is both illiberal and erroneous, and every one who understands the subject must agree with us. Engineers are not produced by other engineers, neither are they produced by any particular class of works. They do not carry society forward, but, on the contrary, society both produces them and urges them along. Like all other men, they float along, mingling with the current of the age; and when not wanted, they float unheard of and undesired. It is the same with characters of all classes, but especially so with those master spirits, which shake the world to its foundations. In the piping times of peace wherein our lot is most luckily cast, there are no Napoleons or Nelsons; but we must not on this account suppose that we are destitute of materials readily convertible into such characters; for let society have a proper demand for them, and they would be sure to make their appearance, not only equal to those which are gone, but superior. Society is progressive, and perhaps its progress was never more rapid than at the present time, while its acquirements were never so varied, so general, or so great. Amid all this mighty and beneficial movement, can we for a moment suppose that the science of Civil Engineering is to stand still—not merely to stand still, but to become defunct for all useful purposes? Is a railroad the *ne plus ultra*—the incomprehensible bourne—at which the Civil Engineer must tumble down, an unoccupied and unmeaning thing in society? If that profession which has been graced by some of the noblest names that adorn our annals, must come to such a sorry pass as this, then it has done very little; and the little that it has done, is in a great measure copied from the ancients. Civil Engineering, in the restricted and proper sense of the term, has been exclusively confined to means of accommodation and conveyance. Harbours, bridges, roads, canals, and railways may be said to comprise the whole of its subjects, unless to them we add certain improvements in the estuaries and courses of rivers, the principles of which are not well understood, and therefore the practice must be defective. We are not so well acquainted with the harbours of the ancients as with some of their other works, and they must have been different from ours, because their ships were different; but no thanks to civil engineers for the inprovements that may have taken place in ship-building. In the matter of bridges, the Romans were certainly equal to us; for there is no modern bridge superior to the bridge of Alacantara, either in beauty of design or stability of execution. Our roads are certainly not equal to the Roman roads, although fitted for a different kind of traffic. Canals, for the mere purpose of navigation, were not very general in ancient times; but the remains show that very few structures, either ancient or modern, were comparable to some of the aqueducts. It is true that our mode of conveying water to cities in pipes, is far superior to that of aqueducts, although the New River, the first successful attempt to bring water to London in this way, is an aqueduct for the greater part of its length; but no thanks to civil engineers for the improvement of our hydraulic system,—they did not discover the weight of the asmosphere, nor the properties of the syphon. Again, the ancients could have no railways, because they had no steam engines; but no thanks to civil engineers for these admirable constructions. Such is the level to which the assertion of Mr. President Walker has a tendency to bring down that profession of which he is the grand representative in this country. But can—shall, the profession of Civil Engineering be reduced thus low? No, not for all the presidents that ever existed, or that ever can or will exist. The Institution never originated, and never can possibly originate, a single engineer; and a man might attend all its meetings for twenty long years, and yet not be capable of turning an arch over a mill stream.

When therefore we enter thoroughly into the fundamental principles of the subject, and inquire whence Engineers and Engineering originate, and what leads their thoughts and labours in one direction rather than another, we must put the Institution aside, as a pretty and innocent but not very useful plaything, and go to the public as the real stimulus and source of the whole. While the public are in a state of progressive improvement, it is not in the nature of things to say what it may learn and do; and as little can any man tell what twenty, or ten, or even a smaller number of years can bring about. Ten years before the first improvement of the Sankey brook, no man would have imagined that the midland counties of England would be scoured, and the four great estuaries of the Thames, the Severn, the Humber, and the Mersey united by means of navigable canals. These canals were not projects of engineers, but arose out of the wants of the public; and canal-making became in the end so perfect a maina, that expensive lines were constructed in situations where they yielded no profit, and were of very little use. This is the mode in which those manias for engineering speculations generally cure themselves, and we shall find it exemplified in some of the railways that are now in progress. In the case of those railways, nobody thought in the year 1822 that ever they would be useful, except within the extensive manufactories of heavy goods, or as between a mine and its port, or other proximate places for depositing the produce. But at present, railways are likely to become the grand means of inland transit both for men and for goods.

These are two very striking instances of the origin and progress of great and general engineering works, of which the engineers themselves had no previous conception. Such being the case, and these works being so recent and so general, clearly prove that vast projects may arise out of the state of society of which the farthest-sighted engineer has not the slightest previous idea.

Knowledge, and the application of that knowledge, are growing principles, and no man can set a limit to the extent to which they shall grow. It is a law of their growth too, that the general excitement stimulates all the individual parts, and calls forth many new ones that were never thought of. Progress was perhaps never so rapid or so generally diffused as it is now, neither did it run into so many new channels: it is true that many of these channels are merely *culs-de-sac*, which lead to nothing; but even they are evidences of the progress.

As to Engineering being exhausted because of the railways; and juvenile engineers having to sit down and whimper, like little Alexanders the Great, because no engineering world has been left them to conquer, it is quite unfounded; all that engineers have yet done for the improvement of any country, is but a scratch on the epidermis compared with what remains for them to do. As we have already said, they have devoted themselves to mere matters of transit and of supposed local accommodation and safety, while the whole breadth of

the land and the greater part of the waters lie neglected, and are allowed to spoil each other in their own way. We admit that great difficulties lie in the way of the Engineer in this matter, the chief of which arises from the division of property, and the absolute right which one having land on the banks of the river has to the property of that river. There is scarcely a stream of sufficient magnitude for being the subject of improvement which does not belong to more than one proprietor, while many of them belong to hundreds; and as each proprietor wishes "to do what he will with his own," and has and exercises the means of carrying the wish into execution, there can be no general improvement, even though it is as plain as the sun at mid-day that such improvements would be beneficial to all. We have a specimen of the mischief that results from different lengths of the same river being under different governments and different laws, in the most splendid river that waters and adorns the surface of the globe. If we take this river and its principal affluents, some of which are at the point of junction larger than what is considered the principal stream, there is an extent of 50,000 or 60,000 miles of inland navigation, without the necessity of any canal. This navigation is gentle and easy, because the downward courses of the river are slow, and the upward navigation is assisted by the trade wind, which blows far inland. But the upper half of this splendid navigation, which is the more useful as being crossed by a number of large rivers, used to belong to Spain, while the lower half belonged to Portugal. There had long been a reciprocal hatred between those nations, and even now that the Spanish Colonies have become independent, the Portuguese of Brazil retain much of their hostile illiberality. Now, if this division among different proprietors is felt on a river which is in some places, far inland, not less than 40 miles in breadth, much more must it be felt in such small rivers as those of Britain. We must therefore exempt the civil engineers from all blame in the non-improvement of rivers, because there is an impediment in the way which they are unable to remove; to get rid of it is the business of Parliament, and it were well if there were some law which would secure to each proprietor his property, and at the same time admitted of the effective execution of general improvements. It is much the same with all agricultural and aquatic engineering until we come to the sea, the most unmanageable opposer with which the Engineer has to contend; and in the matters now stated, as well as every thing that appertains to the improvement of the soil and the increase of its produce, there is a taboo against the Engineer, which not only renders him in so far hostile to the work, but engenders ignorance in situations where knowledge is highly desirable. Thus far, as the law now stands, we repeat that the Engineer is shut out from that field in which his talents would be most eminently useful; and where consequently engineers and promoters of information and improvement could not fail in becoming more moral and reflective in their habits, and thus better qualified for instructing the world. Many other minor matters will suggest themselves to the well-informed reader, but there are some that can only be revealed in the course of time: what has been stated must, however, suffice in the mean time, and we trust that we shall have numerous and early opportunities of bringing forward this subject, more especially the parts of it which relate to increasing the produce of the country, as that is of more interest and utility than all the railways and other schemes in which engineers had been hitherto engaged.

CHEAP BREAD—AND A FIG FOR THE CORN LAWS.

TO THE EDITOR.

THOUGH the title of my paper may seem at first sight to have nothing to do with Surveying, Engineering, and Architecture, yet the reader had better look into the paper itself before he comes to any such conclusion. Titles are often very treacherous matters; as in the case both of things and of men, the title may be the antipodes of the reality. This holds especially true in many matters connected with the engineering professions, and in many persons who use presumptive titles which lead the public to conclude that they are highly gifted for carrying into effect all the operations belonging to these professions. This is very clearly illustrated in even the highest grade of members in the Institution of Civil Engineers. When we look at the published list, we are apt to exult in the mighty phalanx of engineering talent which this class embodies: but when we inquire into the professions and pursuits of the parties, we find the actual civil engineers reduced to a little squad, and the great body of the muster roll made up of "Tom, Jack, and Harry," and other parties of common grade who are no engineers at all. It is not profession, it is not learning, it is not talent, nor is it the combination of all the three, which is the passport to this distinction; it is a certain status in society; and if a man possesses this, he is qualified enough for the highest engineering honours, although the commodity of which he superintends the making, or in which he deals, may be hob-nails or mouse-traps.

Now, when there is this remarkable difference between the verbal sign and subject signified, in so high and honourable a department of society, it would be too much to expect that a humble individual, whose ultimate aim is to contribute his mite to a periodical Journal, the main object of which is to investigate principles, should be able to make his title a perfect index to that which he wishes to say. Thus much for preparatory apology; and now for my main subject, which I trust will be found equally novel, gigantic, and useful; but I think it will be better to address it to the man whom I believe to be best able to give it effect.

TO WILLIAM CUBITT, ESQ., BUILDER, M.I.C.E. &C.

SIR,

Notwithstanding the lofty pretensions of architects, and the labours of other builders, you must be considered as *par excellence* the restorer, and in some instances, the re-creator of the British metropolis; and if statues of really great men are to be fixed in Hollow Square, about the promenade of the new Royal Exchange, your statue would be more appropriate than any of those former and forgotten kings, who never did anything for the city of London but eat its beef, drink its wine, and tax the industry of its inhabitants. In your own locality at Gray's Inn Lane, you have converted a spot, which used to be abominable with lay-stalls, into most convenient dwelling-houses, enough in number to form the chief town of many an English county. Furthermore, you have converted the site of a portion of Fleet-ditch, erewhile the filthiest sink that shed pestilence through the air, and wafted dead puppies to the Thames, into a clean and spacious street; and to say nothing of the tasteful exterior and the convenient interior of the buildings you have erected, you have converted the air, which formerly was the cause of typhus and numerous other putrid diseases, into the balm of life and vigorous health.

In other parts, and for other parties, your labours have been still greater and more beneficial; for, even though a field has been from time immemorial the rendezvous of the most worthless characters, you have only to stretch the line over it, and lo and behold, it is covered with squares and streets, fit for the mansions of the first nobility in the land. Your foot-rule far outdoes the rods of all the rhabdomancers, and the wands of all the enchanters. You have only to strike it against the ground, and the sand and clay are instantly converted into bricks; and then to wave it on high, and then those bricks instantly gather themselves together into palaces.

In the course of these extensive and valuable improvements and structures, you must have used more deal boards than any man in the three kingdoms, and consequently produced more sawdust. Now, I want to have some conversation with you about the deal boards, or rather the sawdust; but previous to this, there are one or two preliminary points to which it may be as well to draw your attention. They bear upon this result: with the saleable part of your deal, you have done much to improve the lodgings of a vast number of people; and if with the sawdust, which at the present serves no very useful purpose, you could increase the quantity of their wholesome food, it would make you doubly a benefactor. I think, nay, I am sure that you could do this, and if you would do it, builders, and other producers of sawdust throughout the country, would not fail to follow your example. From the immense quantity of building that is going on, sawdust is very plentiful; and were it all to be converted into human food, I am certain it would yield more than all the wheat that we could obtain from every foreign land under the canopy of Heaven. In this way, instead of grumbling at the scanty supply of wheat and the consequent high price, we should speedily become an exporting nation, —have enough for ourselves, and a surplus for the benefit of other nations, which would be one of the best reforms that ever was introduced, and one which would raise us, as the introducers, very high in the general estimation—make us the grand benefactors of the world, as it were.

You have been so long and so profitably conversant with deal boards, battens, beams, quarterings, and every thing else made of deal, that I must conclude that you are so well acquainted with the whole natural history and properties of the *Pinus* family—more especially the *Pinus sylvestris*, which is the best one for the purpose of which we are speaking, that I can possibly give you no information. There are many, however, who are less generally and accurately informed; and it is for their sakes that I write this paragraph. With the exception of the turpentine that is in it, this species of Pinus consists almost entirely of esculent and nutritious substances, if these are duly prepared. Even children, in countries where the *Pinus sylvestris* is plentiful, and grows vigorously, know this full well, for they climb the trees in order to get at the shoots; and when they have got these, they carefully slip off the young leaves and the bracteæ or scales, remove the terminal buds, and eat the remainder with great zest. This is, however, in the very early stages of the shoots, and before the leaves have made their appearance from under the scales. Shoots, in the same stage of their growth, and thus cleaned, make, when boiled, an excellent and wholesome asparagus, which is crisp and tender, and has not the slightest flavour of turpentine. Also, when the cambium, which is to form during the season the new layer of wood, is in greatest abundance, and just beginning to thicken, it can be scraped from the interior of the bark and the exterior of the wood, and is a very sweet and palatable substance. Farther, in the winter season, when the cambium is reposing in the liber or inner bark, that part of the bark with one or two of the layers next it is removed, slowly roasted to dryness, and then ground or pounded into not an unwholesome meal by the upland Norwegians, whose country is but ill-adapted for growing even the coarsest bread corn.

This is the preliminary information, and you will not fail to observe that it follows a sort of series. Now, whenever we find a series in any natural production, it always leads to something of practical value, and therefore we should follow it up till we arrive at that value as the reward of our investigation. Want of attention to this makes us throw away as waste a number of substances which are of the greatest utility, if we would but examine them and find out what they are fit for. The instances of this which have been verified by the fact are very numerous, but we shall only mention sulphate of zinc, and barytes, which once were considered as intolerable nuisances by the miners, but which are now sought after with avidity, as substances of great value in the arts.

With sawdust it was and continues to be much the same in Britain, and indeed in most countries. The quantity of it is very great, but the value is almost nothing, and it is used for the most worthless purposes. Yet, if the parties knew, while spreading sawdust over any ale-house or shop, they were actually scattering loaves little if at all inferior to the best wheaten bread, surely they would act differently.

It was not to be expected, Sir, and you must be aware of the fact, that any discovery of the kind hinted at would be made or acted upon in Britain. The country is too rich for that, and the current of practical philosophy runs in very different channels. I admit that there are in Britain men, and men of the highest order, who pursue philosophy for its own sake; but the instances in which this is conjoined with practical results, though some of them have been most splendid, have been remarkably few, and it is very doubtful whether they are on the increase. The practical philosophers of Britain follow the general law of British society, and are bent on the accumulation of wealth, not on the advancement of science. If we wish to find the latter, we must go to a poor country, where voluptuous allurements do not draw the philosopher aside from the proper line of his studies. Philosophy resembles mutton thus far, that it loses all the raciness of its flavour when its pasture is too rich. Hanover is such a country as we have been speaking of: great part of it consists of sandy plains and mossy moors, very ill adapted for the growth of the cereal grasses. But the southern part of the country swells up in the wild and picturesque mountains of the Hartz, which are covered with dense forests, especially of pine: much of this pine is cut down and sawed, and of course a great deal of sawdust is produced. A learned professor of Göttingen, whose name we forget, carefully analyzed this sawdust, and was delighted to find, that when the turpentine, or the essential oil and the resin which composed the turpentine, were roasted off or otherwise removed, without charring the residuum, that residuum was found to consist of the same ingredients, in the same proportion, as wheaten flour. In a country where, after meeting with one quartern loaf, an achromatic Dollond of considerable power would be required to find another one, such a discovery was not to be neglected. Accordingly, the philosopher got a supply of sawdust, contrived an apparatus for roasting it with the requisite degree of slowness, and was overjoyed to find that his family relished the bread of it far more than the common Hanoverian

bread. Owing to prejudice, most likely, the example of this philosopher was not followed; but several years ago, no other bread had been used in his family for twenty years, and if he is still living the practice is of course continued. I cannot call his name to memory; but I have an impression that he was a man of some eminence, both in literature and in philosophy. At the time to which I allude, I saw, examined, and tasted a portion of this bread which had been baked in Göttingen, and had been subjected to many long stoppages on the way from thence to London. It had been prepared in the usual way with yeast, and the sponging of it resembled that of the finest flour, when pure and unadulterated. It was not staler than good bread of three or four days old; and though the colour was a little darker than the best wheaten bread, the smell and taste were exactly similar; and I have no doubt that the bread is equally nutritious, and even more wholesome.

Of the statistics of this bread from Hartz Forest sawdust—the cost of the raw material, the drying or roasting, the grinding, the yeast, the process of manufacture, my informant said nothing. But as the operations are nearly the same as in the case of wheat, they may be taken at the same cost; and thus the proper comparison is between an expensive article, and one which is worth almost nothing.

Now, Sir, as you have what may be called a most extensive manufactory of sawdust, which dust is nothing but an incumbrance and nuisance upon your premises, the sooner you set about manufacturing it into bread, it will be the more honourable to yourself, and the more useful to your country. You may not have heard of, or at least attended much to, this subject, for I know that your professional labour is so great, that few other men would be equal to it; now, however, that I have put you in possession of all the leading facts, you will be inexcusable if you do not set about it without delay.

There is one precaution which I shall give you, and which, unless you observe, I have great doubts as to your success in making good bread. You must not indiscriminately mingle the sawdust of all sorts of pine timber, and you must take care that the sawdust of no other species mixes with it. It is to the sawdust of the *Pinus sylvestris*, and to that only, that the experience of the German professor has reference, and no other can of course be warranted until put to the proof. Above all, you must be especially on your guard against the sawdust of American pine, all the varieties of which are spongy and porous, and liable to speedy decay. It is therefore impossible that good bread can be made of them, because they are deficient of those elements which good bread requires. Taking them on the average, I should say that bread from them would resemble bread from wheat that had been sprung or soaked in the ear. It would be badly coloured, I presume, and would not sponge rightly; but, just as is the case with soaked wheat, a loaf cut in the middle would present the appearance of an outside box with a lump of raw dough in the centre.

Above all, I would take the liberty of warning you never to use one particle of white pine sawdust. The dismissing of it from your premises altogether would greatly improve your manufacture of houses, as well as your manufacture of bread; and this, you will perceive, would be a double advantage, both in the filling of your pocket and the raising of your character. I very much suspect that bread from white pine would operate like wheat tainted with ergot, producing rubigo and other dreadful diseases, and causing fingers and hands to drop off, which of course would bring the whole of the manufacture into utter discredit, and that which you have the means of rendering one of the greatest blessings to the country would be utterly lost.

T. W. G.

NOTES ON BUILDINGS, OR MORSELS OF CRITICISM.

No. III.

1. If size alone constituted grandeur, or columns sufficed to produce richness, Sutherland House would be many degrees superior to what it really is. Leaving design out of the question, there is a meagreness of manner and poorness of style in the architecture, that causes it to partake even of meanness. There is no study or beauty of detail whatever; the windows are most common-place and insipid, and the basement, merely streaked with a few horizontal stripes—after the fashion of a leaf in a school-boy's ruled copy-book—is both barbarous and vulgar. Except on the north side, the columns are altogether useless, those in the south and west elevations being merely detached from the building, without forming any kind of loggia, while, as far as effect is concerned, they could very well be spared altogether. Those on the north side form an upper portico or loggia over that below for carriages; and it is about as poor and insignificant a piece of design as can well be imagined. Although the upper portico may be called hexastyle, according to the number of columns in front, it is only tetrastyle according to that of the intercolumns, which last are by much too wide, although narrower than the intercolumns on the flanks, which look as if a column had there been taken away. And it is inexplicable how people who affect to talk of proportions can tolerate such exceedingly offensive disproportions as there present themselves. Although very far from being a *broad-brim*, the cornice is certainly most quakerly, and the entrance door to the ducal mansion would not be at all out for character for a Friends' meeting house.

Since it was first erected, the house has been heightened by the addition of another story, which, however, is certainly no improvement to its external appearance, for it makes the order look more insignificant than before. As to the design itself, it is commonplace in the extreme, without a particle of originality—without even the slightest indication of *gusto*. And yet, first and last, about three times as much has been expended upon it as the Reform Club has cost, to which it will bear not the slightest comparison, in regard to style and design.

Well, let us hope Barry will erect something more palatial and dignified in character for Lord Francis Egerton; and that the future Bridgewater House will prove a worthy specimen of an English nobleman's town residence.

2. The new façade of the Royal Institution in Albemarle Street is one of those things which "Guide Books" are in the habit of qualifying by the epithets "grand" and "magnificent;" and with those or some other *talismanic* words of the kind, they generally dispatch—in more senses than one—the subject of their *criticism*. For our part, all we can see in it to excite our *admiration* is the evidence it affords of the architect's incapacity—of his utter want of either imagination or invention of any kind. There certainly is a long range of lofty fluted Corinthian columns; but the contrast between them and the building itself is ludicrous, or rather one that makes us groan to witness it. The windows have merely

architraves, and those so exceedingly plain and scanty, that they might nearly as well have been without them. No doubt the architect would say, that even now there is barely room for them between the columns: very true; consequently, so much the more preposterous was it to introduce columns at all, when, by omitting them, and bestowing all his decoration upon the windows, he might have produced something more consistent, and also less hackneyed; for it is very certain that windows alone afford extensive scope for decorative design, infinitely more than seems to be even imagined, if we may judge from the eternal repetition of the same pattern, with scarcely any variation at all, as if the limits of a mere architrave were never to be exceeded for the dressings of windows. It is true, Italian architects have sometimes proceeded to the contrary extreme, and in their attempts at novelty and richness, have produced only uncouth fancies. Yet, instead of deterring us from similar attempts, their failures ought rather to instigate us to them, for there is still something left for us to accomplish in designs of that class, namely, to combine richness of decoration with studied elegance of form and composition—for which purpose, even their failures may serve for our instruction, by guarding us against similar errors.

3. It may be presumed, that the façade of the "Club House Chambers," in Regent Street, was intended as a specimen of the Italian *palazzo* style; yet by no means is it a prepossessing one; and therefore serves to convince us, that quite as much depends upon the *gusto* with which a style is treated as upon what the style is in itself. Of gusto, there is most obviously nothing; but, on the contrary, a great deal of trumperyness, both as regards the design and execution. As far as it admits of comparison with the two specimens Barry has given us in Pall-Mall, the contrast is most egregiously to its disadvantage. Nothing, for instance, can be more dissimilar from the character of those façades, than the manner in which the windows of the different floors are crowded together: in fact, those of the two upper ones may be said to be united. The uppermost windows being arched, produces a disagreeable effect, nor is this at all diminished by their having likewise metal-work balconies before them. Altogether, this front looks like a coarse, slobbered, and school-boy imitation of the style it professes. We are truly sorry for it; we speak neither from any prepossession in favour of Mr. Barry, or against Mr. Burton personally; so far from it, that we should be exceedingly gratified by having the opportunity to say of the latter Mr. B., that he had rivalled or surpassed the other.

4. An architectural critic in the Art-Union, speaking of the sulky and dowdy-looking front of the Conservative Club House, Pall-Mall, which, by the bye, looks sulkier and dowdier than ever, since the Reform Club House has become its neighbour, says, "The balcony to the windows above the ground floor, with its railings and consoles, is well managed." So far from agreeing with him, we think that part is altogether bad, and strangely at variance likewise with the affected simplicity of the design. Most certainly, a *hanging* balcony of any kind is a very disagreeable incongruity, in what pretends to be Grecian as to style; nor is that fault at all redeemed by any elegance or taste shown in the design of the balcony itself. On the contrary, so far from contributing to decoration, it looks quite unfinished, as it consists of little more than a hand-rail and the upright bars which support it at intervals, with scarcely any thing to fill up the gaps. The railing to the area is equally bad; more massy, it is true, than that before ordinary houses, but not at all more tasteful; for if it is massive, it is also clumsy, and with nothing whatever of Grecian character in its form. It may be said that such matters as these are trifles,—are at least of secondary importance in a building; and, indeed, so far as they admit of being corrected at any time without pulling down any part of the edifice itself, they are not of the consequence they otherwise would be; but then, so long as they are not corrected, they continue vexatious eyesores. It is, besides, precisely in trifles or minutiæ of the kind—by the attention to or neglect of them, that we discover an architect's own taste. Where there is no exact precedent to be followed, as for a portico, which, as usually managed, requires no design at all, but merely to arrange a row of so many columns (copied from some established authority) beneath a pediment,—where there is no such direct guidance, but the architect is left to the instinct of his own taste and feeling, it is then that he makes it evident what his own taste really is. Accordingly, by the taste shown in the Conservative Club House—and we may also add the College of Physicians and Union Club—the taste of Sir Robert Smirke is excessively poor indeed; we should say it is below zero, but most assuredly it is at the freezing point, it being scarcely possible to conceive any thing more frigid and insipid, and in a more chilling mannerism, than are his productions.

ENCOURAGEMENT AND PATRONAGE.

TO THE EDITOR.

SIR,

MORE than once I have heard it commented upon as a rather singular circumstance, that for the last five or six years there has been a considerable falling-off in architectural publications of a higher grade and of artistical character, because it might naturally enough have been supposed that the establishment of a Royal Institute of Architects would have tended in some degree to foster a taste for such productions. That it should have had quite a contrary effect is somewhat startling, yet such is undeniably the case.

Except one solitary volume of its own "Transactions," the Institute has published nothing—has brought out no work that it would be hopeless to expect from private enterprise and speculation; neither has it directly or indirectly promoted architectural publications by other parties. Nay, it does not even afford them the paltry patronage of purchasing a copy of any work of the kind; for unless I am very grossly misinformed indeed, a copy is almost expected as matter of course, and of compliment, to be furnished *gratis* by the publisher. Fine encouragement, fine patronage truly!

Surely it would be more becoming on the part of the Institute, not merely to purchase architectural works for its own library, but to go a step further, and take additional copies of every work deserving encouragement, for the purpose of sending them as presents to foreign academies or individuals, from whom they so frequently receive presents. But it seems it is all *taking* and no *giving* with the Institute, which is certainly not exactly the way to impress its correspondents abroad with any high ideas of English liberality. Or should it be said by way of excuse, that this country now produces no works worthy of being sent as a return for those by Professor Hansen and others, who have contributed to enrich the library of the Institute, it only forces upon us the awkward

question,—What has the Institute hitherto done in any shape to promote architectural publications of the class alluded to? Nay, what has it even attempted to do? I am afraid it would puzzle any one to answer such questions at all satisfactorily.

I remain, &c. &c.

ZERO.

SUBJECT FOR A TELFORD PRIZE.

IN the Number immediately preceding, we had the pleasure of commending the subjects which the learned Council of the Institution of Civil Engineers have this year recommended for Telford prizes, and had we been in existence at the time of former announcements, we have no doubt that we should have had to do the same.

We have indeed, again and again, heard complaints of the manner in which these Telford prizes are distributed; and the most general allegation is, that the essay which is accompanied by the prettiest pictures gets the prize, although the essay itself should not contain a particle of sense. If this were true, it would be very bad; but believing, as we sincerely do, that the truth of it is an utter impossibility—a mere vindictive story trumped up by some unsuccessful applicants, we say no more, but leave the offenders to their remorse. Had we paid any attention to them, it is not very likely that we should recommend for one of the Institution prizes the very recondite and important subject which we are about to enumerate.

Every one who knows any thing, must know that neither creating nor annihilating goes on in the material world by natural causes or physical agents. There is One who alone can create or destroy; and though He has appointed his agents to perform changes without number, yet they cannot increase or diminish the quantity of created matter by the smallest particle. Any piece of matter may be mechanically divided, or chemically decomposed, in an endless number of ways besides those that are known to us; and it may enter into unnumbered compounds, and pass from compound to compound in more ways than we can count: still, not an atom is lost, and the substance may again return to the state from which it set out.

This is a law of nature which is perfectly general, and, therefore, there can be no exception to it in any particular case; that such should be the law, gives us great confidence in many of our investigations of nature, more especially of such as are of a chemical character, and though that is less in our way, it gives us confidence in what is really of greater importance. The human body may be separated into more atoms or particles than arithmetic can sum up, and each may be situated countless thousands of miles from the one nearest to it; and yet all those particles may again be brought together, and form, not a similar body, but the same identical body to which they originally belonged. All this may be done by the physical causes, though among those causes there is no provision for bringing the body to life,—that is a matter which is quite inscrutable to our ordinary philosophy.

We have mentioned this general principle and the illustration, because they naturally lead us to the subject which we would most respectfully suggest for a Telford prize; and so we now proceed to the enunciation of that subject itself:—In the working of a steam engine, coal, or whatever fuel is used, is the most expensive article; and in some cases, such as that of a long sea voyage, where the places for supply are very wide apart, much of the stowage of the vessel is occupied by the store of coals, and thus the value for commercial purposes is greatly diminished, or the freight of the goods correspondingly increased, either of which lessens the value of the steamer.

The coal which is used for heating the boiler and producing the steam, is reduced into certain gases, which escape by the chimney and are dissipated by the air, and a greater or less quantity of residual matter, according to the quality of the coal. But though the coal is thus decomposed by the process of combustion, not one atom of it is lost; and the grand desideratum is, to contrive apparatus and an operation that shall collect and retain all the products and reconvert them into coal. This is the subject which we would recommend for a Telford prize; and it must be admitted to be a very important one. It is not a mere visionary scheme like the endeavour to find a perpetual motion, or any of the other impracticable fancies with which the busy heads of small and ill-informed projectors are frequently occupied. That it is practicable, requires no demonstration, for it is self-evident. It involves the violation of no law of nature, either mechanical or chemical, because it requires nothing to be done but what can be done by the common operations of the chemistry of dead matter. If the product sought for required to be endowed with vegetable life, or even with organization, such a requisite would bring the case into the class of impossibilities; because, however wonderful some of the results of chemical combination may be, no mere chemistry will produce an organized substance of any kind whatsoever. Leaving the animal world out of the question, organization can be produced by nothing but a living vegetable; and, therefore, when that is sought for by apparatus and experiments, the attempt is always a failure. We never saw coal recomposed of the materials of former coal, nor did we ever see it produced by any of the earths or metals; but, under close confinement, great pressure, and a long continued intense heat, we have seen it produced from very unlikely substances. If any of the graduates of the Institution should think of trying this matter—it is rather out of the way of mature engineers, whose object is to get money by the individual job—we would recommend that they should first make themselves intimately acquainted with the account of the late Sir James Hall's experiments on the conversion of chalk or powdered shells into granular limestone. The success of these experiments fairly overthrew the objection of the Neptunists, and proved that limestone, marble, or crystalized carbonate of lime, may alternate with rocks decidedly volcanic; and, notwithstanding that the vulgar prejudice is against them, those who attempted to recompose coal might, after many failures, at last be successful. The art of recomposition, though a very important one, and one which might be highly useful to engineers, has not received the attention which it deserves; and that it should be thus neglected is no honour to the parties.

ON SOME OF THE CAUSES WHICH IMPEDE THE PROGRESS OF THE ENGINEERING ARTS IN ENGLAND.

IN the course of our Journal, we have had again and again to remark, that the general character of British society is most unfavourable to the construction of public works. So watchful have the law-makers all along been over what are called "the rights of property," especially real property, lands or houses, that every pro-

prietor is in himself a little independent state, while a man without property does not count, and is just "nobody at all." Hence, if a public work is in any way to affect these little states, the whole of them must be bought over, or won in some way or other, before the work can be carried into execution. There is no general power that can see the necessity of such works, and plan and execute them according to system, so that the one may harmonize with the other. The parties poke away, each in his own hole; and thus they are always countermining, and, where they can, *under*-mining each other.

This holds through the whole of society, from the sovereign to the owner of a pig-stye; though the sovereign is excluded from the property class, and ranks with those who have no property. The monarch has nothing but what the pleasure of parliament doles out; and though a parsimonious one may contrive to make some savings out of the yearly pay, yet one shilling dares not be laid out in the purchase of a rod of land or of the meanest hovel. A new point may arise in the case of our present most gracious soverign; because she has married a foreigner, who is not of our royal stock, nor has he any other status in the country, but as the husband of her Majesty. He, therefore, upon getting letters of naturalization, might purchase property in this country; and if the queen and he were both to put themselves on short commons, she might save, and he receive the savings, and lay them out in the purchase of land or houses, without the infringement of any law.

From this peculiar situation in which the British sovereign is placed, that sovereign cannot by any possibility be an efficient promoter of the engineering sciences; it is not to be supposed that a high and royal personage, who cannot hold property in the country, shall lavish any part of that income which the country allows upon public works; for it is not more than enough for state purposes—and those little gifts which a sovereign is understood to bestow. Therefore, if the queen wishes to promote a favourite public work by contributing a few thousand pounds to the expense, she would have to go to Parliament to beg for it, and thus she would be nothing but the almoner of that body, and, consequently, whatever were her wishes, the gratitude would not be to her.

The principle which thus operates upon the owners of real property, and upon the sovereign, literally cuts English society to pieces. The bands between each individual and his estate are so tightly drawn, that he has no hearty connection with the rest, and few kindly feelings for them. The result is, that, though boasting of their country is an every-day habit with Englishmen, there is no such thing as the love of country that exists among them. The estate of every man is his country, just as the fiction of law says, that every man's house is his castle; and the individual estate and its owner are fortified by old baronial feelings against all that is without. One way in which this disseverment of the country into a vast number of small parts operates, is the carrying on of all intercourse upon the mercantile principle. This is calculated to make a great trading nation, but it strikes at the root of all the affections that link society together.

Perhaps the most serious part of the whole is the placing of the sovereign in a situation which precludes any thing great and royal from being done. "The king's name is a tower of strength;" but it is a tower of strength only when all the materials of the fabric of which it is properly the head, are skilfully laid, and firmly cemented together. Now, the circumstances which we have enumerated make British society a mere heap of stones, or building materials, each detached and independent of itself, and having no union with the others. This actually descends from the sovereign; for though the sovereign has no social power in a legal point of view, the office is necessarily looked up to as the highest in the country. Its example is accordingly taken, and followed by the nobles of the court, and the nobility generally, with whom exclusiveness is the chief object of pride; and it feels its way downwards in society to a much greater extent than those who have not studied the subject would be apt to suppose.

Such a system as this must react upon the parties, and produce an indifference to every thing of a public and general nature, which would not exist in persons left to the free exercise of their own minds. We find proofs of this in other countries, even in those of which we abhor and deride the governments as being despotic. There are, of course, despots of all dispositions, just as there are nobles, bishops, beggars, or persons of any class you choose to name; and very much depends upon the personal character of the despot. If, however, he is not a mad warrior, or an absolute sot, the chances are in favour of his being a promoter of public works. These accommodate the people, and consequently please them; and therefore the promoter gets praise for what he does, and his people are cemented together, and their government made more easy. Thus, for instance, the Emperor of Austria has constructed a splendid highway, from the south-eastern extremity of his empire, near the Adriatic, to the north-western, in Bohemia. This grand thoroughfare passes over lands inhabited by many nations, speaking different languages, having different feelings and customs, and being aforetime in animosity and hostility with each other. But this grand line of mutual and reciprocal intercourse will act as a bond of union; and be equally advantageous to the people, and secure and easy for the government. To the people, it will allow a free interchange of commodities, over a very large extent of highly diversified country; and this will be a means of wealth, knowledge, and a disposition to active and useful employment. When this dispostion is once fully imparted to any people, a very great advance has been made towards their complete civilization; and we find that, in the rude and distant parts of our own island, the opening of the roads and other channels of communication, has been attended with a very rapid improvement. Perhaps the roads in the wilds of Ireland have not been productive of the same happy effects, but there are counteracting circumstances there, with the nature of which we have no immediate concern.

Upon the sovereign, whatever may be the title, the effects are not less happy. He sees what he has done, feels that it is duly appreciated, and therefore he sets about doing more. At the same time, the good feelings which he excites in the breasts of those people who profit by the work projected and carried on by royal authority, relieve him of great part of the anxiety, and almost all the danger, of government. These things apply to the case of a monarch of average talents and love of the arts; and in times of peace, and where civilization is advancing, there are certainly more above this grade than below it. There is also an inward satisfaction to the monarch, far more pleasant and more enduring than any which he could have in victory over the most powerful opponents, or in making the largest additions to his kingdom. These are splendid matters to the public eye; but it is to the public eye only that they are splendid. The deeds which bring them about are deeds of blood, and though a man may exult over them in the hour of victory, or amid the plaudits of approving multitudes, they are

no pleasant matters to carry in the bosom and be a man's associates, or the subjects of his meditation in his hours of retirement. And, when the final catastrophe comes,—and it comes to the greatest monarch as early as to the humblest man,—then they bite like serpents, and sting like adders, and there is nothing to allay the grief of the torment which they inflict. Even in the case of a monarch who is merely tied up, like the monarch of Britain, from planning and executing public works on a great scale, there is a deterioration of the character—a lowering of the mind of the monarch, as well as a loss to the people. The arts themselves are, however, the most serious sufferers in those cases; because, if you withdraw the patronage of royalty, that patronage, like the tail of the dragon in the sacred book, draws the third part—and more than the third part—of the stars along with it.

We find the British sovereign attending the theatres, dining with the Lord Mayor, parading about on public occasions, giving small sums to the indiscriminate charities whereby crafty men endeavour to get themselves popularity and pence; but we do not find anything like a patronage of the arts. Of some of the fine arts, as they are called, there may seem to be a little, such as looking at picture exhibitions, or appearing at a concert; but it is very doubtful whether these are anything more than mere attempts at showing off; and we never heard that either the brush was more mellow, or the violin more pleasing to the ear, for all the royal patronage they ever received.

In the case of the engineering arts, there is not even a show of royal patronage. The monarch may be present at laying the foundation stone of a building, if quite convenient, or may look at one if near at hand; but does nothing to promote either the one or the other.

When we glance back at the list of our kings,—and the Revolution of 1688 will be distant enough for our purpose,—we do not find one patron of the arts among them. George III. had the longest reign; but his forte wavered between the formalities of religion and the fury of war; and, if we take recorded history as our guide, the latter was by much the favourite. Much was done for the arts during his reign; but of that he himself did nothing; and we have no doubt that he would rather have heard of the conquest of some useless island in the remote seas, than have seen the dingy brick houses of London converted into spacious palaces. Still, George had talent, and if his situation had been such as to lead him to it, and get him honour by it, there is little doubt that, though he never would have made an artist, he might have become a patron of the arts. In agriculture, the only art to which he seriously devoted himself, he showed no deficiency either of skill or of taste; and subsequent neglect has not yet completely obliterated all traces of improvement on "the king's farm at Kew."

George IV. was perhaps the most talented of all the family; but his talent, though of the same warlike caste as that of his father, had unfortunately taken a turn for bijouterie, in as far as the arts were concerned. We have seen a good many of his sketches for little ornamental things about Windsor and elsewhere; but it struck us that there was always bad taste in them, for they are loaded with ornament to downright deformity. Of Buckingham Palace he is understood to have been the architect in chief, that is, nothing was executed until it received his approbation; and perhaps this same palace is the best epitome that could be given of George himself as an artist. In one respect it is unique as a building; and perhaps there never was one of so large size made to look so extremely little, by the way in which it is broken into small compartments, and loaded with ornaments. The interior of some of the rooms is highly laboured, and the monumental parts, especially the bas-reliefs in some of the friezes, are prettily done; but still, though the apartments look gorgeous and costly, their appearance is not elegant. This is the fault of the whole building: there is no congruity and balance between what should be the substantial part and the ornaments; and after you are fatigued with one of the latter, there is nothing upon which the eye can repose and refresh itself, before you are attracted by another. One thing must however be said: a better, though in many instances a gaudy, style began to be introduced into the street building of London during the regency and reign of this monarch. We cannot say that he so much as gave the hint, far less set the example, in any of those matters; but still, originating as they did during his sway, they will be associated with his name. Some idea of his taste for sculpture may be found from the horse of Charing-cross, the model of which met with his approval, but which, having been refused admittance at Windsor, was set up between Cockspur-street and the Haymarket, with a figure of George III. on its back, as much out of keeping with the form and attitude of the horse as the very worst taste could desire.

William IV. never made any pretensions to taste in the arts, though it was probable that he was by no means destitute of such taste. His saying, that the National Gallery would "do for a dog-kennel," and the tone in which he said it, proved that he could tell when the rules of good taste were violated; and this is a very important matter in a patron of the arts.

Our present sovereign, from her youth and from various other circumstances, cannot be supposed to do much in this way, even if she had the talents and the power, but having neither the one nor the other of these, she does, and can be expected to do, nothing at all with this matter. That the queen possesses talent, as well as energy of character, we do not for a moment doubt, but the training of her mind has been in the accomplishments of a well-informed lady, and not in the engineering arts; therefore, supposing she had the power of patronizing great public works, we must be pardoned if we say she has not the ability. As for her royal consort, who is spoken of as an excellent and amiable young man, he is not only in a situation which gives him no power, but, on the contrary, debars him from taking the lead in any public matter of importance, but he has not standing enough in the country for being put forward as leader in any public matter. Thus our sovereigns, and the same may be said of those immediately about them, never can be patrons of the arts, and more especially in the engineering department. This is well for the royal parties themselves, because it exempts them from what would give them some trouble. It is especially advantageous to the present royal pair. In the bloom of opening maturity, they have, of course, all the love of endearment and domestic happiness which belongs to their age, and in which nature will triumph over the formalities of royalty itself; and, therefore, it would be a violation of nature's sweetest law to draw them forth from their rosy bowers and sparkling waters, to give their opinion on cold collections of bricks and mortar. When the hey-dey of life, however, is over, and reason brushes all the little flattering passions into repose, they require something more than the enjoyment of their own company to fill up the cup of happiness. It is true, that, if Heaven should bless them with a numerous family, these may add a little to the contents of the cup; but

they will not fill it, and something more will be desired. To prevent worse from happening—although there is less danger of that in the case of a queen, it were to be wished that they should give to the arts all the patronage they can. Here we must not be misunderstood: by patronage, we do not mean the giving of sums of money, either to institutes or individual artists, because we are convinced that these tend to the degradation of both. A man who has received large bounty from a patron, never again can stand straight before society as a man. There is a feeling in his heart that he has been a beggar, and this feeling is apt to wither the strength of his mind. The cash of kings, or of any patrons whatsoever, never made or improved an artist, and never will. But the countenance has a charm in it, and may do much; and, if it were once known that the queen and her consort took these matters heartily into favour, the nobility would very soon do the same. Granting, however, that all this were done, and done to the fullest extent that the fondest lover of the arts could wish, it would not remove the bar which is in the way of the engineering arts. A sculpture in his atelier, or a painter at his easel, may be inspired by royal patronage, and the elbow of a fiddler may move more blithely if royal praise rosins the bow. All these, in themselves, have complete command over the materials, and can do as they list with them. When, however, we come to the engineering arts, by which a public work is to be extended to a long distance, and trench upon the properties of many individuals, the patronage even of royalty does not remove the impediments which thence arise. Parliament steps in and forbids all interference, except in virtue of a statute; and, if there is an opposition, a sum equal to the whole cost of the work may have to be expended before that work can be begun. So well is this understood by certain parties, who hang about the lobby of the House of Commons, looking out for squabbles, that they no sooner hear of the projecting of a new work which affects the property of a good many parties, than they set about scrutinizing into the characters of those parties, ascertaining who are favourable to the measure, and who are indifferent. This being done, they set upon some of the latter, and by all the arts which cunning and determination can practise, labour to push them on to an opposition, in which the agitators are the only parties that profit. The only way of avoiding this is to buy up those agitators in the first instance, or as many of them as will keep the rest in order; and this being accomplished, opposition, even by the voluntary art of the parties opposing, becomes rather a difficult matter. Such is the system in this country; and while it continues to be the system, the engineering art will never be patronized, even to the extent to which influential parties in the country have means of patronizing them.

Having to go to parliament in order to obtain power to execute a public work, is in effect nothing else than paying a sum of money for that power; and this is the main reason why public works are so much more expensive in Britain, than works of the same extent in other countries.

It would be unfair to mention names, but we have heard, and from pretty good authority, of instances in which members of parliament, who wished to obtain large prices for lands and houses of little value, promoted with all their might at the outset, bills for the carrying on of public works, which should require those properties; and then, when they found the bill secured in parliament, and the projectors in high glee about their job, they turned round, and became violent opponents, nor did they desist from this opposition until they had received bonuses which brought the price of what they had to dispose of up to an amount which they could not have had the face to demand in public, and the half of which would not have been given them by any jury.

All these evils, and many more which we could enumerate, arise in the want of a projecting and patronizing power on the part of the sovereign, or some other superintending influence, which shall be above and completely control all parliamentary doings, and all private proprietors. In what we have now written, we have had reference mainly to the railways, because these form the last great system of public works; because they have come and are coming more thickly upon each other than any former ones which we can call to mind; and probably also because there are more and grosser jobs connected with their history, than of that of any others. If we could bring to light all the secrets of their history, and combine them with what is publicly known, we should have a thorough exposure of the British or parliamentary system for granting permission to construct public works. Into the secrets, we have but little chance of looking; but there is enough above board to show how much inferior we are, in this matter at least, to those who live under absolute despots, that plan the public works and get the honour of them, leaving the benefit to the people.

ROMAN ARCHITECTURE.

The Penny Cyclopædia has distinguished itself by numerous articles on the subject of architecture, which, so far from being ordinary compilation, are some of them entirely new, nothing of the kind, beyond indeed the mere explanations of the respective terms, being to be met with in dictionaries professedly and exclusively architectural. Of this a very striking instance is afforded by the article *Portico*, which, besides being treated at considerable length, and illustrated by several plans, is accompanied by an exceedingly useful table of the principal modern examples of the kind. The articles *Civil Architecture*, and *Egyptian*, *Gothic*, *Hindu*, *Moorish Architecture*, &c. are, although necessarily rather compressed, written with ability, and so intelligently as to interest and instruct the general reader. There are also several articles of architectural biography which are not as yet to be found in any other English work; for instance Ohlmüller (architect of the splendid new Gothic church at Munich), Quaglio, Quarenghi (who erected many stately edifices at St. Petersburg), and Ventura Rodriguez, the Spanish architect *par excellence* of the last century.

As "Roman Architecture" refers to several other articles in the Cyclopædia, it treats chiefly of the points of difference between that and the Grecian style; and the following extract will show that we get something more than the mere *dictum prius* of other writers.

If there were no other distinction between them, that arising from the arch, and diverse applications of its principles to vaults and domes, would be a very material one; but we also meet with a variety and complexity in Roman buildings which does not occur in those of Greece. The only instance that we are acquainted with in Grecian architecture, of anything like grouping or combination of building, is that of the Erechtheion, or triple temple on the Acropolis of Athens. With this exception, Greek temples were merely simple parallellograms, differing from each other as to plan only in the number and disposition of the columns around the cella; consequently, however beautiful when considered separately, a very great monotony prevailed in that class of buildings, at least, in which the forms were so limited and fixed as to preclude any fresh combinations, or anything approaching to what is understood by composition.

By the adoption of the circular form in their plans, whether for the whole or parts of a building, the Romans introduced an important element of variety into architectural design; especially when we consider that to such shape in the ground plan is to be ascribed the origin of the *tholus* or concave dome, which harmonizes so beautifully with all the rest, and renders the rotunda-shape at once the most picturesque and the most complete for internal effect,—that in which both unity and variety are thoroughly combined. The Pantheon alone would suffice to convince us that the Romans were not mere copyists, and that if as such they deteriorated the Greek orders, they also added much to the art, and greatly extended its powers by new appliances. As regards its exterior, the Pantheon presents what is certainly a strikingly picturesque (and what we consider to be also a consistent and appropriate, because a well-motived) combination, namely, of a rectangular mass projecting from a larger circular one. In that example the body of the edifice, or rotunda itself, has no columns externally; but circular peristylar temples, or rotundas, whose cella was enclosed by an external colonnade, were not uncommon. Of this kind is the Temple of the Sybil, or as it is otherwise called that of Vesta, at Tivoli, an edifice of singular beauty, and interesting as a very peculiar and unique example of the Corinthian order, the first application of which in any modern building was made by Soane, at the Bank of England. Edifices of this kind were covered with hemispherical domes, or with smaller sections of a sphere, which consequently did not show themselves much externally, as they were raised only over the *cella*, and therefore the lower part was concealed by the colonnade projecting around it. The dome of the Pantheon is hemispherical within, but is of very low proportions and flattened form without, for its spring commences at about the level of the first or lower cornice of the exterior cylinder, and is further reduced by the base of the outer portion of the dome being expanded and formed into separate cylindrical courses or gradini. If the dome had sprung immediately from the upper cornice, so as to present a perfect hemisphere on the outside, the rotunda itself would have looked merely as a *tambour* to it, and the effect would have been as preposterous as if the cupola of St. Paul's and the colonnaded rotunda on which it is raised were placed immediately on the ground, instead of being elevated upon a larger pile of building.

Polygonal forms of plan were sometimes employed, of which there is an instance in what is called the temple of Minerva Medici at Rome, which is circular on the exterior, but internally decagonal, with nine of its sides occupied by as many recesses, and the other by the doorway—a remarkable peculiarity, it being very unusual to enclose a polygon within a cylindrical structure, although not the contrary, nor to erect a cylinder upon a square or polygonal basement. Octagon plans were by no means uncommon: such forms were frequently made use of for the saloons of public baths; and there is an instance of an octagonal temple, supposed to have been dedicated to Jupiter, in one of the courts of Diocletian's palace at Spalatro. Of hexagonal structures we are acquainted with no example, but a court with six sides occurs in the remains of the temple of Baalbec, not however a regular hexagon, but of elongated figure, two of the sides being 110, and the remaining four, 88 feet each. In the later periods of Roman architecture, circular and polygonal structures became more frequent, and those of the first mentioned kind deviated considerably from the original simple rotundas and circular temples. An inner peristyle of columns was introduced so as to make a spacious circular or ring-shaped ambulatory around the centre, which was much loftier than the colonnade, being covered by a dome raised upon a cylindrical wall over the columns. What is now called San Stefano Rotundo, at Rome, supposed by some to have been originally a temple dedicated first to Faunus, afterwards to the emperor Claudius, and by others to have been a public market, is a structure planned according to the arrangement just mentioned, with a circular Ionic colonnade of twenty columns and two piers. The Church of Santa Costanza, traditionally reported to have been a temple of Bacchus, but now generally supposed to have been erected by Constantine as a baptistery, and afterwards converted by him into a funeral chapel to his daughter Constantia, is a remarkable example, owing to the columns being not only coupled, but unusually disposed, and to there being arches springing from their entablature, that is, there are twenty-four columns (with composite capitals) placed in pairs, on the radii of the plan, or one behind the other, forming twelve inter-columns and as many arches; and as far as the mere arrangement goes, this interior is strikingly picturesque; but it would be an improvement, if the dome were in such case to spring immediately from the imposts of the arches, and the latter to groin into it; or at least were it to spring from the vertex of the arches.

The circular form was a favourite one with the Romans for their sepulchral structures of a more pretending class than ordinary. It will be sufficient here merely to mention those in honour of Augustus and Hadrian. The tomb of Cæcilia Metella is a low cylinder, the height being only 62 feet, while the diameter is 90; and it may be considered as nearly solid, the chamber or cella being no more than 19 feet in diameter. This cylindrical mass is raised upon a square substructure; which combination of the two forms is productive of agreeable contrast; and it was accordingly frequently resorted to. The tomb of Plautius Sylvanus, near Tivoli, consists also of a short cylindrical superstructure on a square basement, but is otherwise of peculiar design, one side of that stereobate being carried up so as to form a sort of low screen or frontispiece, decorated with six half-columns, and five upright tablets with inscriptions between them. The tomb of Munatius Plancus, at Gaeta, is a simple circular structure, of low proportions, the height not exceeding the diameter, and therefore hardly to be called a tower, notwithstanding that it is now popularly called Roland's or Orlando's Tower. Of quite different character and design from any of the preceding ones, is the ancient Roman sepulchral monument at St. Remi, which consists of three stages; the first a square stereobate, raised on gradini, and entirely covered on each side with sculptures in relief; the next is also square, with an attached fluted Corinthian angle, and an open arch on each side; and the uppermost is a Corinthian rotunda, forming an open or monopteral temple (i.e., without any cella), the centre of which is occupied by two statues.

As instances of other combinations, we may briefly refer to what is called the tomb of Virgil, near Naples, consisting of a square substructure surmounted by a conical one; to the Roman monument at Constantina, in Africa, conjectured to have been a cenotaph in honour of Constantine, the lower portion of which is a cylindrical structure, surrounded by a peristyle of twenty-four Doric columns, and carried up as a lofty cone, in receding courses or gradini, leaving at its summit a platform for an equestrian statue.

REVIEWS.

Architectural Competition. By Henry Austin. Weale, 1840.

THIS little brochure, which appears as a letter to Earl de Grey, professes to be intended to still those waves of architectural jealousy, which always yeast up into breakers of wrath when a fat job is on the tapis for competition. In order that our readers may fully and fairly understand its nature and bearings, we shall first quote the substance of the scheme itself in the words of its author, and then offer a very few short remarks of our own. The following is the outline.

My proposal is: That the Institute of British Architects shall make known to the public, and to the profession, that they are willing to undertake, in conjunction with Building Committees, the management and decision of all cases of competition on the following conditions:

1. That on any competition being proposed, application shall be made to the Institute to take necessary instructions for the contemplated building.

2. That in every such case, a responsible person, fully qualified for the office, shall be deputed by the Institute to proceed to the spot, to consult and advise with the local authorities on all necessary particulars; to prepare a plan of the site; to obtain all information as to the nature of the ground and neighbourhood, the accommodation required, the funds at disposal, the description and cost of building materials, the foundations, levels, drainage, aspect, &c. &c. That he shall prepare, with the assistance of the Committee, a document, fully entering into detail on every such point, that it is essential competing Architects should be acquainted with. That this document shall be printed, and distributed to Architects desiring to compete, on application to the rooms of the Institute.

3. That the competition shall be open, as at present, to all members of the profession, and that no advantages whatever shall be obtainable by parties connected with the Institute.

4. That the Architect of the successful design, shall *in every case* be intrusted with the superintendence of the erection of the building, at the usual per centage; but that he shall receive no premium.

5. That the second-best design (and third and fourth, as the Institute may determine,) shall receive a certain amount of premium, fixed by them at a per-centage rate on the estimate, or at their discretion, according to the difficulties to be surmounted in the design.

6. That the period allowed for the preparation of designs, the scale and style of drawings, shall likewise be determined by the Institute.

7. That in every case the designs shall be required to be lodged, on the day fixed, at the rooms of the Institute.

8. That the Architects shall accompany their designs with a specification, and any explanatory remarks they may desire to offer with reference

to them; and that they shall likewise furnish an estimate so far detailed, or with the amounts under each separate trade, or such information with regard to quantities and prices, as will enable the judges to come to a decision as to its probable accuracy.

9. That the names of the Architects shall not in any case appear on the drawings.

10. That the whole expenses of the competition, with the exception of premiums, shall be borne by the competitors themselves; and that a fund shall be formed for that purpose, by the payment of a certain sum by each competitor on depositing his design. The amount to be thus paid, shall in every instance be previously stated in the instructions furnished for the guidance of competitors.

11. That on the receipt of the designs, the whole of them shall be immediately arranged for exhibition at the rooms of the Institute, or at some other place of exhibition selected for the purpose: and that the public shall be admitted to inspect them.

12. That such of the competing Architects as can attend for the purpose, shall, after a given period for the examination of the designs, severally deliver to the Institute their written opinion of the merits of the five (or more) best designs, excluding their own.

13. That the five designs that shall have received the greatest number of favourable opinions, shall then be laid before a Committee composed of a certain number of members of the Institute, not competing, and the same number of gentlemen of the Building Committee, to make their selection therefrom.

14. That in cases where it would be inconvenient for deputations from the Building Committees to meet members of the Institute, in order to come to a final decision, the members of the Institute shall, by themselves, in the first instance, examine the designs; shall make their own selection, and shall then forward them to the Building Committee, with their remarks and the decision for their guidance, but without recording the number of votes that have determined the result.

15. That the designs that shall have obtained the greatest number of united votes of the two divisions of the Committee, shall relatively be selected for execution, and for the award of the premiums offered.

16. That the Institute shall be at liberty to publish in their Transactions all successful designs they may think fit; and that the Architects concerned shall finish all drawings and particulars necessary for so doing.

In this project there are only four words in the preamble, and one of these words repeated again and again in the course of the sixteen clauses, to which we have any objection; and these are the words, "Institute of British Architects." The members of this Institution may, for aught we know, be all men of first-rate talent, though the unjust decision of the public has laid many of them on the shelf; but though they engrossed the whole Architectural talent of the country, and the designing and executing of every work of importance were given to one or other of them, that would not in the least invalidate our objection. They, even formed of the best materials that could be had, are still a self-constituted body, and we do not think that the British public, or even British Engineers, would suffer themselves to be under the surveillance of a body of this kind. But as the case stands, they are worse even than this; they are a mere sept, or clique, and we are not sure that the principle which drew them together was disappointed at the worldly men among them not being more employed. We know very little about them, however, of our own personal knowledge, and therefore if we are in error it is involuntary, and we are sorry for it. We do not even like that Earl de Grey should be the president of a society which is to have the chief control over every important architectural structure throughout the whole kingdom; we say the whole kingdom, because we can find no clause in the project which limits the control of the Institute or its committee, and therefore they might as well demand a surveillance over a building to be erected at Inverness, as over one to be erected in London. It is true that they have no power analogous to that named in the project, and therefore all that they say falls to the ground. If they had a chance of getting any power, we should strenuously object to a lord being the president. Earl de Grey may, for aught we know, be an excellent connoisseur in architecture, or, for aught we know, he may be perfectly ignorant of it; but when we find a Lord President to an association of this kind, we have our misgivings: but, waving those misgivings, expunging the name of the Institute, and substituting some more appropriate name in its place, we think the rest of the plan very good, and creditable to the talents of Mr. Austin.

Marquois' Parallel Scales. By E. Clifford, Teacher of Mathematics.

These few pages, and the instruments to which they allude, will be of considerable use in geometrical drawing, especially where a number of parallel lines have to be drawn at short distances from each other; and where the common scale and dividers cannot be very accurately depended on.

Preliminary to the account of Marquois' scales, there is a rule given for reducing divisions of any measure, say of an inch, which are not found in the common scales, to the equivalent value in divisions which are found there. This is nothing but the simple arithmetical problem of changing the denominator of a fraction without changing its value, which is done by multiplying the given numerator by the proposed denominator, and dividing the product by the given denominator. This problem is so very simple that the merest tyro in arithmetic must understand it; and therefore we think it was not worth Mr. Clifford's while to occupy nearly five pages out of sixteen in giving an elaborate explanation of it. It may be, however, that the students he receives for mathematics know nothing of the principles of arithmetic, and in that case he is quite excusable.

Marquois' scales consist of two rectangular plane scales and a right-angled triangle. The rectangular scales have the inch variously divided; but they do not appear to possess any advantage over the common plotting scales. The chief value consists in drawing parallel lines, which is done by means of the triangle. The triangle has the shortest side about the right-angle, equal to the one-third of the hypothenuse. In using it, the longer side, about the right-angle, is made to coincide with the base line, or principal line to which the parallels are to be drawn, and in it the plane scale is applied to the hypothenuse and adjusted to the base line. When a parallel is to be drawn, the triangle is moved along the plane scale to the right or left as may be necessary, until the distance moved along the plane scale is three times the proposed distance between the parallels. This is done for all the parallells that may be required; and as the hypothenuse, which slides along the scale, is three times as long as the perpendicular, the paralels are distant from one another by one-third of their measures on the scale as laid down by sliding the triangle down the plane scale. The advantage consists in having three times as much space for determining the lines as the lines are apart, whereby the errors of vision are reduced to one-third of what they would be, were the moving of the triangle, and the distance of the parallels, measured on the same scale. This is founded upon what is called the Dutch parallel ruler; but it is a great improvement upon that, as the ruler does not give the distances of parallels. A little practice is necessary before these instruments can be properly handled, but after that is once learned, there are advantages in expedition as well as in accuracy.

On Atmospheric Locomotive Engines. By J. D. Samuda. Weale.

At page 140, of our first volume, we offered a few remarks on this application of the steam-engine to the impelling of carriages

along roads. In the course of these we started some objections, with the desire of eliciting the full truth in future statements, by the parties interested. Many trials have since been made, and Mr. Samuda brings forward the present pamphlet with a view of showing the superiority of atmospheric pressure over steam.

We admit that some of the points are well made out, but the two which are most in favour of the atmospheric pressure do not appear to us to be stated with sufficient clearness. They are these: In the first place the immediate moving power is relieved of the weight of the engine and its tender, which are estimated at twenty tons on the average. This is relief from a great weight,—and besides lightness in the traction, the rails and other parts of the roadway may be made less expensive, and there would be much less wear and tear upon the rails. In the second place, the propelling power is not a traction, but pressure; and being the pressure of the atmospheric fluid, it operates, or can operate, equally in all directions, upwards, downwards, or laterally. This also is a very great advantage, because it enables a train to traverse a hilly country, or one where the roads are crooked.

Against these advantages there are certain disadvantages to be set off; and the balance of the two must determine the relative merits of the locomotive engine and the atmospheric pressure. In both there is an intermediate power, or rather a means of adaptation between the steam-engine, as the prime actor, and the load, as that which is acted upon. In the locomotive engine this adaptation is the biting of the driving wheels upon the rails. Something must be lost by this in all cases; and if we suppose both rails and wheels were worn very smooth, and the line had even a very moderate ascent, the power of traction would be gone, and the driving wheels would turn round without advancing forward a single inch.

In the atmospheric pressure again, the action of the engine tends in no way to the moving of the train, it merely exhausts the tube along which the atmosphere impels the piston. In this there is also a good deal of power lost; and in the experiments, about three-fifths of an atmosphere is the highest pressure they have been able to obtain. But it is not only the friction of the air-pump that has to be deducted in this particular case; for there are the imperfections to which the tube itself is liable. If the tube is taken in even half-mile reaches, there must be much leakage by the valve: and if heavy loads are carried for some time, we think that a tube cleft for its whole length, and with a piston working in it, would be liable to twists, and openings, and irregularities of the cleft, so that it would become more and more leaky every day. Now we shall say that the engines employed in both cases are of equal power, and deduct from the locomotive its own weight, and the loss arising from imperfect biting on the rails; and then we have its net power as a force of traction. So in like manner, if from the power of the stationary engine we reduce the friction of the air-pump, and the imperfection of the vacuum arising from leakage of the tube, or any other cause, we have the net power of propulsion given to the atmospheric pressure.

If Mr. Samuda had gone into a thorough investigation of both these losses of power, and brought the net results side by side, then we could have judged of the relative merits of the two plans. But Mr. Samuda avoids this comparison, or at all events does not enter into it in such a way as to satisfy any one; and by this apparent avoidance of the main foundation of the whole matter, he lays that matter open to suspicion. We would therefore recommend to him to publish a second edition, or rather a new pamphlet, if the experiments shall prove satisfactory.

Theoretically we may observe, that the expectations are, in so far at least, in favour of the atmospheric pressure; for all the objections to it, with the exception of the friction of the air-pump, depend upon causes of a constructive mechanical nature, and thus, if it be possible to make the machinery fine enough, they may be got the better of. In the locomotive engine again, the engine itself is a dead weight, which is absolutely necessary for making the driving wheels bite on the rails and perform their duty; and thus there are no means of getting rid of it. The same may be said of the loss of power by the imperfect bite on the rails, which can no more be entirely got rid of than can the weight of the engine. But though theory is thus in favour of the atmospheric pressure, it is impossible to say what practice may effect, until we shall have had the proper experiments: and thus the parties should make those experiments as speedily and as carefully as possible.

One vast advantage of the atmospheric engine is the universality of the direction in which the immediate power may be made to act. In ascending a hill, of course the train and its load must be lifted, and the power necessary for doing this must be taken from that which produces the forward motion, and consequently that motion will be slower than upon level ground. But in the locomotive engine, where the forward motion is given to the centres of the driving wheels, and the biting of the wheels on those rails is the fulcrum from which motion is obtained, there must be an actual diminution of the power, with every increase of the height of the plane ascended; and so rapid is this diminution, that an acclivity which would not be at all felt in the atmospheric application, would entirely destroy the power, and put an end to the progress of a locomotive engine. The comparison between motion applied at the centre of a wheel, and starting from the circumference of that wheel, with motion produced by pressure of an elastic fluid, has not, however, been thoroughly investigated, and therefore we earnestly recommend it to Mr. Samuda, or to any other who may have an interest in this matter.

Though all the parts which are yet unsettled should turn out in favour of atmospheric pressure, and it should be demonstrated that this pressure is every way superior to the travelling engines, we rather think it would come too late. The lines of railroad between the great towns, which Mr. Walker mournfully declares to be the final efforts of Engineering, have been all made to suit locomotive engines; and the expense of them has been several hundred times greater than would have been necessary for the atmospheric system. But people are apt to estimate things, not by their real value, but by their cost, and therefore the parties concerned will cling to their excavated and embanked lines, and their locomotive engines, whatever may be the result in pence or in peril to the public. It will be observed that we do not say that the atmospheric engine is preferable to the locomotive, for the points upon which this runs have not been properly investigated, but we do say that everything connected with it is worthy of investigation, and that, if this mode of propelling trains had been known previous to the commencement of the railway system, several millions might have been saved for other improvements.

When we formerly noticed this project at the page of our first volume to which allusion has been made, we pointed out some of the imperfections of the apparatus as it then stood, and of the experiment as it then stood, and because we did this, some of the

parties interested fancied that we were hostile to them. But in thus fancying they were quite in error. We have no hostility to any party, or to any scheme, unless there are persevering attempts to thrust it upon the public after it has been proved to be bad. As far as the experiments have gone, at the time that our remarks were made, the results were by no means satisfactory; and, as no very clear or demonstrative arguments in favour of the scheme had been brought forward, we felt it our duty to lay open the weak side, in hopes that that might induce the parties to lay open the strong one for a contrast. They have not done so up to this moment, and therefore, if people have suspicions of their scheme, the fault is their own, and not that of the public.

Observations on Railway Monopolies, and Remedial Measures. By Alexander Gordon, M.I.C.E. Weale, London, 1841.

This is a pamphlet published by Mr. Weale, the great publisher for the scientific professions: it is the composition of Alexander Gordon, Esq., C.E., who has all along been a consistent opponent of railway schemes and monopolies, and has shown no small hostitily to railways themselves. In the first of these matters, we in great part, although not entirely, coincide with him in opinion; but we think that, in the latter, he has allowed himself sometimes to be carried away by prejudice, and at other times to be too much actuated by the popular clamour of the day. This is especially the case with regard to the accidents which have taken place on the lines, and which he appears to be in error in attributing to the very nature of the rails and engines; whereas every one who is at all acquainted with the subject, must see that carelessness and inexperience are the grand causes of them. If he had estimated the number of persons travelling, and compared the number of accidents with the amount, he would have found the average of all the lines considerably less than with the same amount of traffic by means of coaches.

Upon both the principle and practice of the great railway companies, in seeking to connect important and distant points with each other, without much regard for the intermediate country, Mr. Gordon was a prophet from the outset, and the result has fulfilled his prophecy to the very letter. To prophesy rightly on this matter was not indeed a process requiring much depth of divination; for that which M. Gordon states lies apparent on the very surface, at least as far as the injury to the intervening country is concerned. To trundle along from London to Birmingham, at the rate of some thirty miles an hour, and so on to Liverpool, York, or Edinburgh at the same rate, is not just the way to better any of the intermediate towns, or be bettered by it. We have said already, and we again repeat—as it is a position of which the public ought never to lose sight,—that the gains upon these railways are more than counterbalanced by the losses which the country in general has sustained in consequence of them. They are not public highways; but the property of scheming and selfish, and often very corrupt individuals, whose profit consists in a withdrawal of the natural trade from the public highways, and of the funds which would keep these in order,—both of which go into the pockets of the railway speculators, and are the only means by which they can pay or publish even a nominal dividend to the schemers. We say nominal, because upon most of the lines the dividends are not paid out of profits, but by the sale of shares, which, though returned as in the hands of other proprietors, are really reserved to bolster up the trade of the scheme, and aid the schemers, when they get to their wits' end.

We do not believe that so gross and so general a hoax was ever perpetrated on the people of this country. *Ex facie* of the published statements, it appears that the concerns all go on like clockwork;—the whole being held by responsible parties, and the traffic yielding a fair profit. But notwithstanding this, there are many persons who are well aware that there is a constant resource in unsold shares, or in shares professing to be confiscated, though they are merely given up by parties in the secret, who hold them for the very purpose, to keep the concern going with spirit and alacrity. We have also said, that the fares and freights charged are more than double what they should or would have been if the lines had been properly managed; and thus the public are losers every way by these jobbing speculators:—the public roads must become worse; the burdens necessary to pay them must be laid more heavily on those who bear them; and thus, travelling not by railway will be made more expensive, and at the same time more difficult and dangerous. The tendency is, to collect the whole of the business into a few of the great towns, to keep visitors and traffic away from the smaller ones, and thus not only to bring the general improvement of the country to a standstill, but to make it retrograde.

How Parliament came to grant such powers as these—powers hitherto unheard-of in the country, and unknown to the constitution, is rather a puzzling matter. Whether we are aware of it or not, it is very obvious that when the House of Commons thus squandered away the old and sacred right of the people—a free communication between place and place, however near or however wide apart, they threw their own brains into the scale as a make-weight. Many of the brains in the Commons' House are, God knows, heavy enough, but the heaviness is in the mental and moral scale, not in the physical one, and thus it adds nothing to the weight arising from the execution of the schemes themselves. How it got introduced, we have often wondered, and expressed a wish to know from those who are better informed than ourselves; and the answer which we invariably received was, not that the House of Commons were too ignorant for knowing the evils that their own deed would produce, but that they were bought over in some way or other. Some members were chairmen or leading directors in the committees, others were friends to these, and so on; and this led to a great deal of that kind of reciprocal "caw me, caw thee," which two parties are very apt to entertain when they are both engaged in plundering some third party—more especially when that third party is the public. We have heard various motives assigned for this most unjustifiable conduct in the cases of railway committees of the House of Commons; and it has been gravely whispered to us, that when a good job was to be made by a little trickery, the parties who wished to become tricksters always kept in their own hands a portion of money, with which they could make the tour of all the wonderful places in England. Among other things, we have heard of the purchase of O'Connell's Tail, as being an excellent ruse in getting the right sort of committee; but as to the truth of this we shall not inquire. We have nothing to do with the characters and motives of parties, either as members of parliament or as railway directors; and though we had, we would not avail ourselves of the privilege, because it could do no practical good, and thus would be an unmeaning attack upon individuals. Still, however, neither our want of information, nor our delicacy upon the point, has any influence on the result; and thus we are compelled to say that Parliament, by some hallucination, or other means, allowed itself to be shamefully deluded in the case of these same railways.

It must have been a case of hallucination, or epidemic mental aberrance; for when Parliament, acting for themselves, or through a committee of their members, have taken time to examine the subject, the bad parts of it have been the first and the most conspicuous in showing themselves to an impartial inquiry. This is in part shown by the following extract from Mr. Gordon's pamphlet, which we recommend to the careful perusal of all interested in this great national question:—

The evidence published by the Committee of Parliament, 1839, abounds in cases of hardship and gross injustice. The owners and occupiers of land, on lines taken for railway purposes, have suffered deeply. They have often had property, endeared to them by ties which no jury could estimate, forced from them. Men have been compelled not only to sell their property,—the enjoyment and protection of which form the most to be admired feature in a civilized country,—but forced to take such price as others should put upon that, which to them was almost invaluable. To give but one case of this kind—an interference with the rights of property by a wealthy company crushing an individual. "The matter was referred to a jury;" and the director and manager of the Eastern Counties Railway exultingly says, "We offered him £20:" he refused, "the jury gave him £10, and he lost his land and his attorney's bill!" Why? because a Company had Parliamentary power to take it; yet the jury decided upon the implied promises of the Company to complete their line at the cost of less than half what they paid for the land; £200,000 being the estimated cost, and the actual amount paid for the land alone was £500,000. Other cases have occurred equally oppressive; springs and wells of residents on the line having been dried up by the cuttings or embankings, fences destroyed, new fences imperfectly constructed or maintained, and cattle and sheep tempted from their proper pasture, to the more luxuriant, but dangerous, pasture on the railway slopes.

Land has been divided by railways, to the serious injury, danger, and irreparable loss of the occupiers. Valuable property near the line has been destroyed by fire: luggage and valuables have been forcibly separated from passengers, lost, and not paid for: gold has been taken from a respectable traveller, and, without the usual instant proof, has been declared bad by the railway clerk, who had it out of sight, and would not return it temporarily to satisfy the giver. Passengers' money has been exacted a second time. Parents and children, husband and wife, insolently, and even violently, separated.

Cases have occurred of railway companies obtaining an act for a certain line, and spending, upon less than one half of its length, (and that imperfectly executed) the whole money, and incurring heavy debt. And this a line on which individuals had, under the sanction of Parliament, been deprived of their property against their will and interest, by the valuations of a jury who contemplated a complete line.

Time would fail to specify the extent and number of the injuries brought to light by the Parliamentary inquiry. The conflicting evidence of railway Directors and their officers; the clashing interests of different railway Companies; the disparity of wisdom and prudence, the absence of justice, fair dealing, and common honesty, in the courses adopted by some of them, are recorded in 542 folios of the second Report of that Committee's compilations, requiring much time and some patience to wade through, and which Report leaves the impression strongly fixed on every reader's mind, that much more evil still remains undiscovered, which, by reason of the disposition, occupations, or sex of the aggrieved parties, cannot be made public, or reach the ear of either a Parliamentary Committee, or of the counteracting authority lately established in consequence of the Report above quoted from.

The labours of the committees have been great; and no one can read the evidence on which they found, without being struck by the closeness of many of the questions, their pertinent nature, and the patience and perseverance of the investigators on the one hand, and on the other by the evasion, ignorance, and impatience of many witnesses whom they examined. Still, the difficulty of any rigid investigation, of pointed and relative interrogatories by a Parliamentary Committee, the members of which have other imperative and laborious duties to attend to, is apparent. The course of the examination is often changed, and the truth is not so fully developed as it might be, by the systematic and uninterrupted inquiry of a well-organized commission with ample powers.

For wise and wholesome reasons, Government has in other undertakings prevented too large combinations of capitalists. M'Culloch has well said, when referring to public joint-stock companies:

"When these bodies claim no peculiar privileges, but are formed on the principle of coming into fair and open competition with each other and with individuals, there does not seem, in ordinary cases, to be any good reason for opposing this incorporation. But in the event of their claiming any peculiar privileges, or if the purposes for which they seek to be incorporated would give them such privileges, the fair presumption being, that they will employ them to promote their own private interests in opposition to those of the public, they should not be incorporated without the maturest deliberation. Still, however, there are cases in which it is for the public advantage that companies with such privileges should be established under proper modifications."

We need not go into any further statement to show the truth of this proposition; for we think no candid man can refuse his assent to it; neither shall we occupy much space in examining Mr. Gordon's estimate of the comparative merits of civil and military engineers, as superintendents of the conducting of railways. Mr. Gordon, being a civil engineer himself, has of course a leaning to that profession; and decides in favour of its members accordingly; but we question whether Mr. Gordon is sufficiently acquainted with military engineers and engineering for giving, *ex cathedrâ*, a summary judgment on the point, without argument. There are certain circumstances against his opinion. Military engineers are, in proportion to the range of their duties, much better educated than civil engineers; and in respect of the discipline, and love and observance of order, to which the two sets of engineers are subjected, there is no ground of comparison. This, it is true, is only negative evidence; but there is also something very like positive evidence, which, not aware, perhaps, of the case that it makes for, Mr. Gordon brings forward in his book. The public knows, and he sets down in writing, that the great majority of civil engineers have not only become joined to the railway speculations, but have sought to be so joined by every effort in their power: then, being so joined, they have not only lent the weight of their names to the improper doings, but in many instances, they themselves have been principal actors. We have no wish to strain evidence beyond what it can legitimately bear; but on this we should say, that there is quite enough to warn Parliament against employing civil engineers as superintendents on railway lines. Farther, such an appointment would be unpleasant to the engineers themselves, because it might so happen, that the master of the superintending engineer had planned the job, of the frailties of which the pupil was to take cognizance; and thus, to say the least, would be placing them in an awkward situation. We consider what we have said as quite enough on the evils of the system of railways, and we shall accordingly notice in another paper Mr. Gordon's remedies, and any others which may occur to us.

Illustrations of Shakespeare. By G. F. Sargent, and executed under the superintendence of J. Woods. How and Parsons.

This work, which is to appear in numbers,—five plates without any letter-press description in each,—is certainly low-priced. It is not quite in our way, but as it professes to give Architectural Illustrations as well as others, we shall just notice it. We wish there had been letter-press descriptions, because no ordinary artist can unite himself to Shakespeare except by means of a verbal tie; and even this tie cannot bind the ethereal spirit of the bard to the lumbering wheels of a chariot of flesh. We have no desire, however, that the letter-press should have emanated from the same cranium as the advertisement prefixed to the first part; for this advertisement is so dark with the excessive brightness of grandiloquence, that no ordinary person could comprehend a word of it.

Mr. Sargent is, as far as we at present recollect, the only one who has attempted to illustrate Shakespeare with the pencil, without the intermediate agency of the pen; for even in Mr. Knight's splendid work, the pictures illustrate the notes and not the text.

Mr. Sargent too has this merit above most of those who have made pictures for Shakespeare's plays, that he gives us the scenes rather than the actors; and when he does introduce figures, they look such wooden things, and are so giraffish in the legs, that it would have been better to leave them out. Mr. Sargent's taste lies in landscape, in some descriptions of which he is peculiarly striking and happy, more especially on wood. But he is not so successful for plates, although the fault may be chiefly in the engraver. In all Mr. Sargent's landscape drawings for engraving that we have seen, there is a difficulty which few engravers could overcome. His effects are produced by colours, not by contrast of black and white, and thus they come from the engraver in Shakespeare's category of "effects defective," and the "cause" by which they come is the daubing with contrasted colours as we have stated.

Mr. Woods is a neat engraver; but the effects to which he has been accustomed seem to be of the defective kind, and therefore we cannot say that we very much like what he does or what he superintends in the plates which we have seen. In proof we may notice "A Wood near Athens," where no human being could tell the genus of the trees near the foreground, while those that form the back ground look more like a May-mist than trees. The horns of the moon too are, we are inclined to think, turned the wrong way; but that is so common among ordinary artists that it cannot well be censured. Upon the whole, we wish the work success; but to use the slang phrase to the parties concerned, we "wish they may get it."

Treatise on the Improvements and Navigation of Rivers, with a new Theory of the Causes of the Existence of Bars. By William Alexander Brooks, M. Inst. C.E. Weale, 1841.

This is an excellent little book, upon a most important subject, and evidently written by a man who has carefully observed and investigated that subject, and understands it thoroughly. As the subject seems to be little attended to or even understood by the majority of engineers, and as the very ablest of them have fallen into blunders respecting it, we intend to treat it at some length. The book before us furnishes many data for this purpose; but it came to us so late in the month that we have no leisure for treating it as we could wish until a future number. In the mean time, therefore, we heartily recommend the book to our readers as one from which they can derive a great deal of sound information.

Illustrations of the Public Buildings of London, with Historical and descriptive Accounts of each Edifice. Second Edition, greatly enlarged. By W. H. Leeds. Two volumes Imperial 8vo., with numerous Plates.—London, J. Weale, 1838.

We may very well be excused from ushering in this work with an apology for venturing to notice it at all, on account of its having been published about two years ago, and consequently before our Journal had appeared. Did we care about its being considered somewhat informal as well as unusual to review books when they may be presumed to be fairly before the public, we might refer to instances where books, or at least their titles, have been made use of for articles in reviews fifteen or twenty years from the date of their publication. For the mere literary "Cynthias of the minute," such tardy notice, it must be confessed, is monstrously ill-timed, because, if they are not served up instantly by reviewers, whatever is said of them is said too late. Within a twelvemonth, their very existence is generally forgotten, even by the critics who scruple not to speak of them as destined for immortality, and to charm, "like Wortley's eyes, another age."

At all events, there is no such glut of architectural publications crowding on us, but that we can very well find space and leisure to speak of one circumstanced like the one now before us; and, to say the truth, works of the kind are seldom so fully noticed at first, that nothing more is left for after-remark.

As will be seen from the title, copied above, this work is not altogether new, being a second edition; but then, besides being "greatly enlarged" by the present editor, it is also remodelled, and not only enlarged by the additional subjects now introduced, but also by critical remarks and other matters now appended to the original descriptions, to make room for which these latter have been pruned of the excrescences and impertinences with which they were in some places quite overlayed. In fact, the plan first adopted was by no means so good as the idea of the work, which seems to have been borrowed from Legrand and Landon's "Description de Paris," in two vols. 8vo, with architectural elevations, &c. of the principal structures in that capital. Although the scale there adopted is too small to show more than the general style, composition, and dimensions of the edifices, still the work is useful both to those who can, as well as those who can not, consult larger and more detailed representations of the same subjects. Very glad, therefore, should we be to see similar illustrations of the architecture of some of the other capitals of Europe, in an equally economical form; and we are rather surprised that nothing of the kind should hitherto have been brought out with regard to St. Petersburg, Berlin, Munich, and some other cities, where so many important edifices have been erected within the last five and twenty years. It is true, several of those at Berlin and Munich have been published along with their other designs by Schinkel and Klenze; yet, besides that they show us no productions of other architects, those works are of a nature, and upon a scale, to say nothing of their cost, to confine them almost entirely to professional persons. Most certainly they do not supply the place of publications of the other class, neither does this latter popular class at all interfere with such works as are more strictly architectural: on the contrary, by diffusing a taste for such studies, they rather tend to promote their sale, by obtaining for them a more numerous public.

It must indeed be confessed that, both in Landon's work, and the "Illustrations of the Public Buildings of London," some of the largest subjects are shown on too minute a scale,—in fact much smaller than there was any occasion for, owing to there being, in many instances, two or more portions of the same building comprised within a single plate; for instance, a ground plan and section of St. Paul's together. This was a gross oversight and error at the outset, on the part of those who planned the work—an error unfortunately not to be corrected, as many others have been, in the present rifacciamento of it, at least not without cancelling several of the plates, and having fresh drawings and engravings. As the work was originally published in numbers, there was then opportunity for getting rid of that defect—and it must have been visible immediately—by giving the elevations, &c. as large as the size of the plates would admit. Even then such edifices as St. Paul's and Westminster Abbey would have been very inadequately represented; but that inconvenience might have been removed at once, by showing also a single compartment both of the exterior and interior, on separate plates; had which been done, the scale might, in many instances, have been nearly five or six times larger than at present,

or equal to that of general elevations, &c., in folio works. This has, in fact, been done to a certain extent in the new plates, at least as regards the London University, of which, besides the general elevation there is one of the portico and dome drawn to a much larger scale. Why the same was not done in the case of the National Gallery, where there was full as much, or more, occasion for it, we do not understand. A separate drawing of the kind, one half of it showing the external, the other half the internal, elevation of the portico or section through it parallel to the front, so as plainly to describe the doors and other parts within, would have been very acceptable. Should there ever be a third volume, of which some kind of hope is held out in the preface, and for which there are already abundant fresh materials, the hints we have just thrown out will, we trust, not be lost upon the editor—or perhaps we should say upon the publisher, because the other may probably have no control over the choice of subjects and the execution of the plates.

Owing to the mode of publication then adopted, there was at first no kind of systematic arrangement of the subjects, the order or disorder of them being miscellaneous; whereas they are now classified as the Legrand's Description de Paris. This is certainly an improvement, though but a trifling one. The far more important and material improvement consists in that which pervades the literary part, which was at first very indifferently executed, and was in many instances little better than mere compilation of historical matter, with very little of description, and of criticism still less. Although not intended exclusively for professional men, it might have been supposed that in a work so avowedly architectural in character, as far at least as the plates are concerned, there would have been more of explanation and comment in regard to the buildings themselves, and less of micrological and wearisome particularity, in regard to matters of a totally different nature, and relative to which information, if required, may be found in other works, or even in encyclopædias. According to the original plan, if plan at all there was beyond that of filling so many pages, it might be imagined that it was intended to render the work almost a history of London, if not of England, or rather a sort of encyclopædia. Most undeniably it savoured strongly of bookmaking when we found the Custom House, East India House, &c., made use of as pegs to hang an account of the custom duties, and of our connection with India, upon them. It was a mercy that the Roman Catholic Chapel, Moorfields, was not turned to account after the same fashion, and made a pretence for giving us a dissertation upon popery. One sufficiently glaring absurdity was that of lugging in by the head and shoulders, an historical essay on the rise and progress of the English drama, by way of introduction to the account of the present Covent Garden Theatre!

That strange excrescence has been expunged altogether by the present editor, who has given us in lieu of it, what is certainly far more appropriate itself, namely, an original essay on the architecture of Theatres, which contains a great deal of information, no less interesting and instructive than it is new; whereas the other subject was, at the best, only nominally connected with the class of buildings in which dramatic performances are given. At all events, consistency would have required that the account of the Italian Opera should be similarly prefaced by a history of the Opera in this country, for which, Burney's History of Music might easily have been laid under contribution.

What better, however, was to be expected where Mr. Britton was the sole literary manager? He certainly was not quite so scrupulous as to the quality of the letter-press portion of it as he ought to have been, and what is still less to his credit, neither was he at all scrupulous in other respects, since it afterwards appeared he had charged Pugin and the other co-proprietors for articles which had been given by their authors to the publication! And that they were not intended for Mr. Britton's own exclusive advantage and profit, is very evident, because two of the parties expressed their indignation on that trick being discovered, and one of them, we believe, insisted on payment. This piece of literary scandal was not exactly a secret at the time, for Pugin made no secret of it; on the contrary, he ever afterwards expressed his opinion of his quondam colleague in the plainest terms possible. Still, it may be said that, however well-founded it may be, all this has nothing to do with the work itself, or with the present edition of it. Nevertheless, it is so far connected with the latter, as it serves as a key to what must otherwise appear somewhat extraordinary, not to say unjust, on the part of the new editor, who certainly has taken no pains to disguise the contemptuous opinion he entertains of his predecessor. This is so marked in many passages, that it called forth the censure of the Athenæum as an impropriety, although that journal went even still farther, calling Mr. Britton "a silly, gossiping, garrulous sexagenarian," and only objecting to any liberty being taken with him in a work previously edited by himself. We certainly do not pretend to say that Mr. Leeds showed particular delicacy in animadverting with the freedom he has done on Mr. Britton; but then much also depends upon the quantum of delicacy to which the latter was entitled from him. And this certainly appears to have very little indeed; for at page 326 of the second volume, we learn that the greater part of Britton's "Union of Architecture, Sculpture and Painting," was written by Mr. L. himself, and that his name "*was* to have appeared on the title-page;" the evident meaning of which, taken with what immediately follows, is, that a promise to such effect had been made, and was afterwards broken.* Though, no doubt, most confoundedly galled, we presume that under such circumstances, B. himself was far less surprised than any one else, on finding with how little ceremony he is treated in the present work. Fortunately for him, he had just before made his bow to the public, and retired from the stage; consequently exposure of any kind could not affect him as it would have done in an earlier stage of his career, by affecting that vital part of him—his breeches-pocket. His indifference to posthumous reputation he has expressed tolerably plainly in the introduction to his "Worcester Cathedral;" and he seems to entertain pretty much the same sort of philosophic indifference for posthumous character.

We confess that we have dwelt at considerable length upon what does not imperatively call for notice from us, as matters of course; still it is by no means irrelevant, or without its interest: for, it may be presumed, some of our readers have formed a very different estimate of John Britton, F. S. A.,—as least there are persons in the world who affect to consider him the first of our antiquarian

* That Mr. Britton can condescend to dirty and paltry tricks of the kind, we can very well believe, not only because we have heard a good many attributed to him, but because we happen to know of one very strange *accident* of the sort, in regard to one of the plates in his Architectural Dictionary. The drawing, containing a number of subjects, was furnished by a young student named Clayton, who stipulated for no other remuneration than that his name should appear on the plate as the draughtsman, when, to his utter astonishment, he found that of another substituted for it! On expostulation being made, the supposititious name was erased, and Mr. C.'s inserted, yet the impressions with that alteration found their way into only a small number of copies. Now, leaving all promise out of the question, the name of the actual draughtsman or designer should be given as matter of course. After all, too, the manœuvre was a most bungling and stupid one, since it was sure to be detected at once.

and architectural writers, and imagine that he actually wrote all that passes under his name, notwithstanding the strong internal evidence furnished to the contrary, by diversity of style and treatment. Besides which, Mr. B. will, almost of course, be present to the imagination of many as the original editor—between whom and the present one some kind of comparison will inevitably be made, let it be in the favour of which of the two it may.

One great fault, as it appears to us, in the work as first executed, was, that it was altogether deficient in that sort of consistency which might reasonably be expected to pervade what aspired to be something more than a collection of miscellaneous articles; for not only were their respective subjects handled differently by different writers, but the opinions were frequently quite contradictory, that is, as far as opinion was expressed at all. Mr. B. seems to have been guided by no other principle than the convenient one of getting the descriptions written by any body, or accepting whatever was offered, without giving himself the trouble to see whether uniformity of character was kept up. In the new edition, that very disagreeable defect has been, if not entirely removed, turned to account, and made, in fact, to give a certain piquancy to these volumes, which the subject itself does not prepare us for; because not only is a sufficient degree of unity given to the whole work by the editor's own comments appended to each of the original articles; but his remarks frequently differ nearly *toto cælo* from those made by the original writers; or else they contradict them by implication, errors more or less gross being pointed out, which had at first been suffered to pass unnoticed and unreproved. A very striking instance of the kind occurs in the account of All Saints' Poplar, which the editor stigmatizes as a "preposterous farrago," and expresses his surprise that such a subject should have been admitted at all, adding, that it will, however, so far be useful as it affords "an admirable exemplification of that *pseudo-Grecian* style which the architect ought to study, in order that he may know how to avoid falling into it himself." This is certainly making the best of a bad bargain: still we are not at all reconciled to the introduction of such a specimen—thanks for it to Mr. Britton—while both St. George's, Bloomsbury, and St. George's, Hanover Square, are omitted; two churches, that we consider in some respects much better examples than St. Martin's, notwithstanding that the portico of the latter surpasses those of the others in its greater depth, or being what the writer in the Penny Cyelopædia proposes to term *diprostyle*. Even if it was considered not worth while to exhibit the entire design of the two churches above-named, it would, in our opinion, have furnished a very interesting and instructive lesson, had the porticos of all the three been drawn to the same scale, and placed beside each other. With this remark we will for the present conclude, intending to resume the subject in our next Number, and there give some extracts from the work.

THE MENAI SUSPENSION BRIDGE.

Although it may admit of question whether the suspension bridge over the Straits of Menai were the master-work of the mind of Telford, there can be no doubt that it is that with which his name is most intimately and most widely connected; and but little that it is upon this bold and successful specimen of the powers he possessed that his reputation will most likely descend unimpaired to posterity. It is indeed—not even excepting perhaps, the Pont-y-Cyssyllte—the most imposing of his works for the sublimity of its situation, the "poetry" of its conception, and the magnificent picturesqueness of its general appearance. These qualities, so seldom combined in a production of engineering art, make it the "observed of all observers," and attract to it numbers without number of visitors, not only from every part of Britain, but from every corner both of the old and new continent. All who have visited England have seen, and all who have seen have admired it. From Puckler Muskau and N. P. Willis to Louis Philippe and Marshal Soult, all beholders have joined in paying their tribute of homage to the genius of Thomas Telford.

The design of this splendid erection was, it appears, originally made for a bridge in a very different situation. In 1814, Telford had expended much time and trouble in projecting an iron suspension bridge over the river Mersey at Runcorn, and had even instituted a variety of experiments on the strength of iron, with a view to that work, and had constructed a model of it on a small scale. This idea, however, was never carried into effect: but when, in 1818, Telford was applied to on the subject of the passage of the Menai, he reverted to his design of four years before, and applied to it the widely different circumstances of the case before him. This was not the first time that the plan of forming a roadway across the Strait had been broached; so far back as 1801 Rennie had made the plans for two vast iron bridges for the same locality, and in 1811 Telford himself had made a report which included designs of bridges across both the Menai and the river Conway, which is on the same line of road.

Nothing beyond this, however, had been done, and when at the period referred to, the project was revived with greater vigour, the bold and intended plan of a suspension bridge—backed by the confidence which Telford's name and fame by this time inspired, was determined on. Although on the main line of traffic between England and Ireland, the Menai Strait up to this period was passable only in ferry-boats, greatly to the inconvenience and delay, and very often to the imminent danger, of the immense throng of travellers always passing and repassing. Notwithstanding this want of accommodation, a perpetual lease of this ferry having been granted by Queen Elizabeth, (at a rental of 3*l.* 6*s.* 8*d.* per annum,) Government were obliged to purchase the leasehold right, for no less a sum, by a verdict of a jury, than 26,954*l.*, before they could enter upon a work so loudly called for, by public convenience, as a roadway across the Strait.

The site fixed on was at a spot called Ynys-y-Moch, where the breadth of the channel, when the tide is in, is three hundred and six yards, reduced at low water to one hundred and sixty. The main pier on the Anglesea side, which is placed on the Ynys-y-Moch rocks, is above the line of high water, but on the opposite or Carnarvon side, it is six feet below it. The height of the piers, from high water to the roadway, is just one hundred feet, and thence to the apex of each pier fifty-three feet. There are two parallel carriage ways, each twelve feet wide, with a single line of footway between them, four feet in width. The whole is suspended on four lines of massive chains, the distance spanned from point to point being not less than *five hundred and seventy-nine feet!*

The first stone of this stupendous structure was laid on the 1st of August, 1819, by no higher personage than Mr. Provis, the director of the works under Telford. In 1821 and 1822, operations were vigorously prosecuted, from five to seven vessels, and from 300 to 400 men being generally employed, chiefly in the preliminary works of founding and raising the piers, in which so much progress was made, that in June, 1824, both suspension pyramids were completed, and perforated by carriage ways, 9 feet wide: the iron plates and saddles for the reception of the chains were also fixed, in such a manner as to yield pressure only in a perpendicular direction.

When the pyramids were ready, temporary timber framings were constructed between them and the points on the shore where the chains were to enter the tunnels or excavations prepared for their reception. On these framings a set of four main chains was laid, and being secured under the roadway, the other ends were carried to the tops of the east and west pyramids respectively. On the Anglesea side, the chains so remained, but on the Carnarvon side, they were not only carried along the framing to the pyramid top, but brought over and down its surface to the water level. The portion of chain which was to complete the line between the opposite shores was then laid upon a timber float, moored to the Carnarvon side.

To raise this first line of connexion, and fix it in its proper place, was a work of the utmost interest and importance, and one which Telford determined to superintend in person. He accordingly, in the middle of April, 1824, left London for Bangor for that purpose, and resolved to attempt the operation on the 25th, when an immense crowd assembled to witness the unexampled spectacle. On the appointed day, an hour before high water, the raft was cast off, and floated into its required position between the piers, where being moored, one end of the chain which lay upon it, was joined to that which hung down the face of the Carnarvon pier, while the other end was attached to ropes which were connected

with powerful capstans placed on the Anglesea side. The workmen at the capstans then commenced moving at a rapid trot, and in an hour and a half the chain was raised high enough to enable the fastening of a portion of it to the end of the chain on the top of the Anglesea pyramid. Telford himself then ascended, and on proclaiming the gratifying fact, was hailed with enthusiastic cheering from the workmen, and the immense body of wondering spectators. Thus the mainland of Wales and the Isle of Anglesea were for the first time united by the hand of science.

By the 9th of June, 1825, the last chain had been raised, and the temporary platform removed. All doubt and difficulty had now vanished —if they had not in fact from the time the first chain had been successfully stretched across the strait; that proudest moment, probably, of Telford's life. In August the construction of the road platform was commenced, and in September the whole of the trussed bearing-bars were suspended. The platform was composed of two thicknesses of fir plank, with a thickness of patent felt between them, while in the carriage ways there was a third layer across the former, and another band of felt between. By the latter end of 1825 the oak railings on each side having been fitted, the whole magnificent erection was pronounced "complete."

The 30th of January, 1826, was fixed on for the day of opening. This was accordingly a gala day for the whole northern part of the principality, but, greatly to the disappointment of the public generally, the Commissioners, at the solicitation of Telford himself, declined to get up a procession on the occasion, so that almost the only official manifestation of the jubilee feeling so universally prevalent consisted in a plentiful dinner to the large number of workmen who had been engaged on the works. In spite of this, however, great quantities of people assembled on the spot, to gaze with wonder and admiration on the now finished miracle of human skill, and to hail with repeated cheers the modern Merlin, who had thus brought the ancient prophecy* to pass without the aid of a league with the powers of darkness. Alas! for romance! the *London Mail* was (ostensibly) the first vehicle to cross the new "highway in the air." This was followed by the Chester mail, and this again by an endless succession of carriages and pedestrians throughout the day. It is understood, however, that previously to this public opening, Telford himself and his friend Sir Henry Parnell had driven over the bridge in the carriage of the latter, and thus enjoyed the novel sensation of crossing the sea in a vehicle at a height of a hundred feet above the tideway!

It is needless to add that since that day innumerable passengers, including amongst them a very large proportion of the "celebrities" of the world, political, literary, and scientific, have followed their example, and that the Menai bridge, in spite of endless anticipations to the contrary, still "towers in its pride of place" above the flood, and in spite of the fury of the winds and waves, to which its exposed situation renders it particularly obnoxious. The only damage it ever received was in the severe storm of January, 1830, but on that occasion the injury sustained, although exaggerated at first by public report, was quickly and easily rectified.

It may give some idea of the stupendousness of every thing connected with this bridge to state that the total weight of the iron-work only is no less than *four million*, one hundred and seventy-three thousand, two hundred and eighty-six pounds; or two thousand, one hundred and eighty-six tons! There are 16 chains in the breadth of the bridge, each comprising nine hundred and thirty-five bars. Its length is one thousand, seven hundred and ten feet, or nearly one-third of a mile. To descend from large things to small (though small matters here would seem great elsewhere) each coat of paint it requires weighs upwards of *two tons and a half!* Yet with all this ponderousness, the structure is so justly balanced, and so wonderfully adapted to the scenery amidst which it is placed, that to the spectator it appears a model of elegant and almost fairy lightness. It stands forth, like so many others of the works of Telford, a triumphant proof of its constructor's exquisite taste, as well as consummate skill.—*Mechanic's Magazine.*

*They had a prophecy made by Robin Dhu, a famous minstrel, to the effect that the Menai would one day be crossed by a bridge. This was universally looked on as impossible, without the aid of magic.

WARMING BUILDINGS BY HOT WATER.

REPORT TO THE MANCHESTER FIRE ASSURANCE COMPANY, BY MR. JOHN DAVIES, M. W. S., AND MR. G. V. RYDER.

Before we proceed to detail the experiments which we have made, we shall briefly describe the appearances observed, and the information obtained at a few of the principal places which have been visited. We shall be enabled not only to confirm but to extend the statements in Mr. Ryder's first report.

It has been found, on inspection, that Birch Chapel has, at various times since the occurrence alluded to in the former report, sustained much damage. Wood, matting, and cushions have, in a variety of places contiguous to the hot-water pipes, been charred to an alarming extent.

With respect to Mr. Barbour's warehouse, farther inquiry has fully corroborated the previous statements of its having been on fire, close to the pipes, at different times and in different places.

Of the Unitarian Chapel, in Strangeways, the directors are already in possession of information from both Mr. Ryder and Mr. Rawsthorne, and this information seems to leave no doubt as to the injury which has resulted from the use of Mr. Perkins's hot-water apparatus.

The heat in the Natural History Museum having been repeatedly stated to vary in different parts of the pipes, and to become, in some cases, the greatest at places remote from the furnace, the fact has been confirmed by our own observations, and by our subsequent experiments. As this circumstance has excited much interest, and been generally questioned, we shall presently endeavour to assign the cause.

The apparatus, which it may be proper to notice in reference to its general form and construction, consists simply of a long endless iron tube, carried in different directions, from a furnace to which it returns, and in which about one-sixth of the whole length is inserted and formed into a coil, so as to be sufficiently exposed to the action of the fire. The tube is, at the commencement, filled, or nearly filled, with water, which, by the application of the heat, soon begins to circulate, and, in that way, to impart an increase of temperature to the apartments which it traverses. The dimensions of the pipes are such, that, on the average, eleven feet in length will contain one pint of water. Connected with the principal pipe are two others, which are opened by a screw, one to allow for the ultimate expansion, and both subservient to the introduction of water.

As far as lay in our power, we have made such experiments as occurred to us, repeatedly, and under every variety of circumstance.

Not having any instruments which would furnish speedy and adequate criteria for the determination of high temperatures, we have resorted to the inflammation of combustible bodies, and the fusion of others, depending on the recent and high authority of Professor Graham for the degrees which they indicated.

The ordinary method hitherto resorted to for ascertaining high temperatures in pipes, is to file a small portion perfectly smooth, and observe the progressive changes of colour which occur. We did not neglect this expedient; and we witnessed, to great advantage, the successive and beautiful tints. As the temperature increased, we were presented first with a straw colour, then a deep bluish purple, and, finally, with a dark silvery hue. The first is said to indicate 450°, and the blue 600°.

In the Natural History Museum we applied our tests, but were enabled to do so only to a very limited and unsatisfactory extent. Mr. Walker, the proprietor of the patent right for Manchester and the neighbourhood, accompanied us to the establishment of Messrs. Vernon and Co., engravers, where we had the opportunity of trying the system rather better, but still imperfectly. Finally, Mr. Walker acceded to our request, to have put up on his own premises a suitable apparatus, which was to be submitted entirely to our control. It consisted of an iron pipe upwards of 140 feet in length, 26 of which were coiled in the furnace; 20, at least, being freely exposed to the full action of the fire.

In addition to the apparatus, as at first fitted up, we had a branch pipe and a stop cock, which enabled us, by cutting off at pleasure a great portion of the circulation, to perform our experiments on a contracted scale, and under a variety of modifications.

Mr. Walker being from home at the time, placed his foreman entirely under our directions, so that we had the opportunity of pursuing the investigation to any extent which we might think proper. It is but justice to state, that this person rendered, very willingly and with much practical skill, all the assistance which was required.

The apparatus having, on Friday, the 5th ult., been fitted up and found on trial to be in proper condition, the experiments were commenced on the following morning at ten o'clock, when the apparatus had arrived at a suitable state.

I. *First Class of Experiments, viz. those made with the whole length.*

1. The pipe from the furnace became very soon sufficiently hot to singe and destroy small feathers resting upon it.

2. Speedily afterwards the same pipe exploded gunpowder.

3. On the highest pipe, within a foot of the expansion pipe, bismuth was readily melted, denoting a temperature exceeding 470°. The pressure at this point must have exceeded 35 atmospheres, or above 525lb. on the square inch.

4. Feathers were singed instantly, and matches lighted, at the same place.

5. Gunpowder inflamed readily in various parts of the flow pipe, and on the expansion pipe.

6. Blocks of wood, of five different species, were charred; from the deal wood the turpentine issued profusely.

7. Other combustible materials were also severally much charred.

II. *Class of Experiments, with the shorter circulation. By this change a greater pressure was immediately observable, as the expansion pipe and several of the joints emitted steam, and admitted the escape of water.*

1. Cane shavings on the pipe above the furnace, readily inflamed.

2. Lead melted at the same place, and the temperature must, therefore, have exceeded 612°. Making a rough calculation from the table of the French Academy, which does not extend beyond 50 atmospheres, I take 612° to represent 75 atmospheres, or about 1,125lb. pressure on the square inch.

3. Different wood shavings inflamed on the upper pipe.

4. Cotton ignited freely at the same place.

5. Matting inflamed at the same place.

6. Cotton, hemp, and flocculent matter, collected from Mr. Schunck's fustian room, ignited on the returning vertical pipe.

7. The blocks of wood, tied to different parts of the tube, were much acted upon and charred in a very short time.

Observing the expansion pipe to be in a state of considerable agitation, and warned of an explosion, the temperature was reduced, and the experiments were, for a time, suspended.

The pipes having, before three o'clock, been refilled and screwed up, for the express purpose of an explosion, the following experiments were made in the progress of the preparation:—

1. Mungeet was readily ignited.

2. Different sorts of paper and pack thread were destroyed.

3. Bismuth fused instantly.

4. Cotton inflamed.

5. Sheep's wool became spedily charred, in 2″ or 3″ after the stop-cock closed.

6. At five o'clock the sheet-lead, affixed to the upright pipe, freely melted, steam issued violently from the bend in one of the upper horizontal pipes, and, in three minutes afterwards, the explosion occurred in the furnace pipe, at the top of the seventh coil, which presented, on subsequent examination, a lateral aperture of about two inches long, and about one-sixteenth of an inch broad.

In the lapse of two or three minutes after the commencement of the explosion, the furnace was entirely emptied of its contents, which were propelled, in a diverging direction, like one mass of fire, so as almost to fill the apartment. The force with which the ignited embers rebounded from the opposite wall, and other obstructions, occasioned them to scatter in profusion like a shower of fire over every part of the place. The noise was so great as to bring to the spot a multitude of people from the adjoining streets. A number of articles in the shop—as, for example, packing cloth, paper, and hemp—were subsequently found to be on fire in different parts of the premises.

These appearances, and their immediate effects, seem to have been precisely similar to those which are said to have been witnessed at the explosion in the warehouse of Messrs. Crafts and Stell, and would evidently have been adequate, in the same situation, to produce all the consequences.

It may be here observed, that the experiments clearly prove, that the heat, in different parts of the pipe, is not uniform. Generally it is greatest at the highest elevation, where its superior temperature appears to be of the longest duration under ordinary incidental changes. At the commencement of the operation, however, and a short time after fresh fuel had been applied, the temperature was highest in the flow-pipe contiguous to the furnace. Another circumstance likely to produce an inequality of heat, may be adverted to; the tubes are far from being of uniform internal diameter; the consequence of which must be, that as the same quantity of water has to pass, in the same time, through every part of the apparatus, the liquid must move with greater velocity at one place than at another, and thus, from obvious causes, develope a greater quantity of caloric. The difference is sometimes so great in the relative bores of the tubes employed, that in some which were examined, one tube had an internal diameter of 9-16ths, and another of ¾ths of an inch, that is to say, in the ratio of three to four; or, taking the relative areas or sections of the tubes, which represent the relative quantities of fluid contained in a given length, in the proportion of nine to sixteen. Thus, taking the velocity reciprocally as the section of the pipe, the velocity of the water at one part of the apparatus being represented by sixteen feet, the velocity in another part would be nine, or the rapidity of the current would be at one place nearly double that which it was at another.

It is stated, in a work recommending the hot water system, that "the application of heat fills" the ascending or flow-pipe "with minute bubbles of steam, which rise rapidly to the upper part of the tube, and become there condensed into water again;" now, as condensed steam, wherever it occurs, produces about seven times as much heat as the same quantity of water at the same temperature, we have at once a reason for the heat of the pipe being generally greater at a distance from the furnace than contiguous to it. This apparent anomaly, which has been repeatedly observed and denied, admits, therefore, of an easy explanation.

The explosion may, under different circumstances, occur from various causes.

1. As water expands in bulk about five per cent. from 40°, its point of greatest density, to 212°, the boiling point, the expansion must be very considerably more when raised to high temperatures. If, therefore, the pipes be nearly filled with water, and the expansion pipe not adequate, or in proper condition, an explosion must be inevitable. Dr. Graham states, that, from freezing to boiling water, the expansion is 22,76 to 23,76= 100 to 104,4 nearly.

2. The conversion of the water into vapour, producing an expansion which is in the proportion of a pint of water changed into 216 gallons of steam, "with a mechanical force sufficient to raise a weight of 37 tons a foot high," must present a pressure upon the tubes sufficient to ensure their destruction. Dr. Graham makes a cubic inch of water to expand into 1,694 cubic inches of steam, or one pint of water to become nearly 212 gallons.

3. It has been observed, as an ordinary occurrence, by those much accustomed to the apparatus, that, in some cases, a quantity of gas is generated, and has been found to escape in considerable quantity, when an aperture is made in the upper part of the pipes. The only gases which could be thus obtained are the elements of the water, oxygen and hydrogen. The former would probably be taken up in the oxydation of the metal. Now the hydrogen gas, which would remain, has never been deprived of its elasticity, and never made to change its state, by any compressing force hitherto applied. It is obvious, therefore, that inevitable danger must arise from its production. It may be worth while to remark, that air, steam, and hydrogen gas expand in the same proportion by augmentations of temperature. The law discovered at the same time, and by independent methods of experiment, arose out of the researches of Dr. Dalton and M. Gay Lussac. It may be thus expressed: Aëriform bodies expand the 1-480th part of their bulk on the addition of each degree of temperature. Thus, taking 480 cubic inches of steam or hydrogen gas at 32°, the mass becomes, at 33°, 481 cubic inches; at 34°, 482 cubic inches; and so on: or, in a general form, a bulk a raised $d°$ of temperature

becomes $a + \frac{d}{480}$

4. The last source of explosion to which it is necessary to refer, arises from any casual impediment in the pipes; and it is freely admitted, that in frosty weather, such an impediment is likely to occur; it has been found to result from other causes, as in the case of extraneous matter accidently getting into the pipes, an example of which was recently presented in the establishment of Messrs. Wood and Westheads.

In a very obliging letter received, in the course of the investigation, from Sir Robert Smirke, it is stated, that, though he has "never seen the pipes heated sufficiently to ignite wood, except on one occasion," yet, "if a fire is incautiously made when there is a stoppage in the pipes, from frost, or other accidental cause, the pipe within the furnace may be burst or made red hot near the furnace. I have known the pipe," he adds, "so heated only in one instance, when the red heat extended to a distance of upwards of 12 feet from the furnace."

Sir Robert concludes his letter, by suggesting a protective modification of the apparatus. "Therefore," he observes, "to prevent the risk of fire to a building, I would never place the furnace in a room or cellar that is not fire-proof, nor would I have the pipes in any part of their circuit in *actual contact* with wood, or other combustible material. Security," he continues, "is still more effectually attained, by having a safety valve upon the pipe near the furnace, by which, explosion or excess of heat would be prevented."

That which has happened once, may, under the same circumstances, happen again. The exclusion from *actual contact* with combustible materials, could it be permanently insured, would, when the red heat extended along the pipe upwards of 12 feet, afford, at least, very reasonable grounds for apprehension.

On this system of warming buildings, therefore, danger must be produced from either negligence in the feeding of the furnace, or any stoppage in the pipes: the former evil may be obviated by proper precautions; but the latter, occurring unexpectedly, exists unobserved, and precaution and care must be equally unavailing.

Signed JOHN DAVIES,
March 10, 1841. GEORGE VARDON RYDER.

ON THE COMPARATIVE ADVANTAGES OF FOUR- AND SIX-WHEELED LOCOMOTIVES.

Extract of a Letter from the Chairman of the Eastern Counties Railway, to the President of the Board of Trade, dated Oct. 9, 1840.

As regards the comparative superiority of four-wheeled and six-wheeled engines, the Directors, in common, they believe, with every other railway board in the kingdom, are deeply anxious to discover the mode of construction most conducive to public safety. and they cannot but regret that Colonel Thomson, in giving his opinion in favour of six-wheeled engines, has not stated the grounds on which that opinion is based, and the means he has taken to test the soundness of his views on so important and intricate a subject.

A comparison of the accidents, from failure of the machinery, which have occurred upon railways where six-wheeled engines are in use (such as the Liverpool and Manchester, the Grand Junction, &c.) shows that they are most disastrous both in number and extent; while, on the London and Birmingham, the North Union, and Midland Counties, and several other railways, where four-wheeled engines are exclusively used, many millions of passengers have been carried without a single instance being known in which an engine has run off the lines, or a single fatal accident has occurred, in consequence of the failure of any part of the machinery.

The mechanical advantages also of four-wheeled engines are of no inconsiderable importance; and their advantages on railways possessing numerous curves are well ascertained. The principal motions which take place during the transit of locomotive engines, exclusive of their progressive motion along the rails, are—

1. An oscillating motion, transversely, arising from inequalities in the level of the two rails.

2. A lateral or horizontal oscillation in the direction of the line, produced by the cone of the wheels and the small deviations in the gauge of the rails, and the striking of the flange of the wheels against the inside flange of the rails, in consequence of any change in the direction of the road; and,

3. A vertical or pitching motion, resulting from the preceding motions, from deflections of the rails, and from certain small deviations from perfect smoothness of the rails, chiefly occurring at the joints.

Of these several motions, the first is common to all engines, whether with four or six wheels; the second is very greatly increased by the use of six-wheeled engines; and the last is more easily produced in four-wheeled than in six-wheeled engines. The last of these motions, however, being greatly increased by the action of the second, will, for this reason, not be greater, generally, with four than with six-wheeled engines; but the second motion, being necessarily greater in proportion to the greater distance between the extreme points of support to the engine, when it passes at a high velocity along curved lines, is considerably increased by the use of six-wheeled engines; and by producing a very great strain on the axles, is generally considered as the principal cause of the frequent breaking of the axles of six-wheeled engines, from which such disastrous accidents have occurred, and from which the four-wheeled engines are exempt. Such are the grounds which have induced the Directors of the Eastern Counties Railway, on a deliberate view of the subject, to adopt the four-wheeled engines, as both the safest and the best,—an opinion derived from the past experience of the different railways on which the two different descriptions of engines are used. In the experiment alluded to by Colonel Thomson, which is now making on the Eastern Counties Railway, of adding a small pair of carrier-wheels under the fire-boxes of the Company's four-wheeled engines, the effect proposed to be accomplished is very different to what Colonel Thomson appears to consider to be the object. The additional wheels are not calculated to bear an equal portion of the load, but are only intended to support a small part of the weight of the fire-box; by which it is supposed one of the great objections to six-wheeled carriages will be avoided, it being found that, in the ordinary engines of this construction, the several points of support are never simultaneously in contact with the rails when any considerable degree of velocity is attained, thus causing a great strain on the engine, and inducing a tendency to run off the rails, particularly when traversing curves. The full consideration of the respective merits of the two descriptions of engine requires a high degree of mechanical and scientific knowledge, combined with the most extensive observation of the practical working of engines on every possible variety of road, and under every difference of weather, speed, and load. If Colonel Thomson's opinion is based on these comprehensive grounds, the publication of his various data would be of essential service to the railway interests.

It is one of the most important points which solicit the attention of railway boards, and it has engaged the anxious attention of the most eminent engineers, without eliciting any positive result. But, considering the great pains and vast expense which have already been incurred in order to arrive at sound conclusions on this subject, any opinion which is expected to carry weight with it, must be based on the largest and the most comprehensive review of the whole subject, and the data on which it is founded ought to be explicitly set forth.

ARCHITECTURAL SOCIETY OF BRISTOL.

A NUMEROUS meeting, which comprised many of the principal inhabitants of Bristol and Clifton, was held lately in the Theatre of the Institution, Park-street, to receive the report of a committee occupied in forming a society for the study and investigation of ancient, and more particularly ecclesiastical architecture. On the motion of the Rt. Rev. the Lord Bishop of Gloucester and Bristol, John Scandrett Harford, Esq. was called to the chair, and opened the business of the meeting in an appropriate address. Mr. Butterworth, Hon. Secretary, read the report, stating that the Lords Bishop of Gloucester and Bristol, and of Bath and Wells, had consented to be patrons, the Ven. Archdeacons Thorp and Brymer, and other dignitaries of the Church, vice-presidents; and a considerable list of clergymen and gentlemen, members of the society. Several interesting donations to the society were also announced. Mr. Harford then delivered a masterly and highly pleasing inaugural lecture, in which he traced the history of architecture (particularly with reference to the arch) to the earliest times of which there is record; though splendid monuments of these arts existed in Asia and Egypt, of which the origin is antecedent to political history.—Of the lecture, it is impossible to give even an analysis. It dwelt, with great learning and research, on the existence of noble architectural works, reared by the use of the same sciences, in times of which we have no history, and in countries which had no intercourse with each other. It traced the downfall or corruption of this art in different nations, through the ravages of barbarous invaders, the caprice of fashion, the tyranny of princes, or the corruption of national taste simultaneously in architecture and literature. The form of Mahomedan architecture in places of worship Mr. Harford traced to the style introduced by Constantine at Byzantium; the gothic, or church style of Western Europe, to that introduced by the church in Rome, which he termed Romanesque. From this, numerous deviations and ramifications arose in Europe in subsequent times; the causes of which were explained in a most interesting statement. The whole of the above was illustrated by plates and drawings, so that, although the address lasted from half-past two until ten minutes to four, the attention of the audience was keps alive, and its close was accompanied by the applause of the company.

On the motion of the Lord Bishop, a vote of thanks to Mr. Harford was passed by acclamation, for his very interesting, very elegant, and very instructive lecture; with a request that he would allow it to be published. Mr. Harford having acknowledged this compliment with his usual eloquence, expressed a wish to take some time to consider as to the publication, and the meeting separated.

HOSKING'S LECTURES.

IN the present mania for quackery in engineering instruction, it is a great relief to us to turn to the introductory lecture of the Professor of Construction at King's College, Mr. Hosking, C. E.

"It is, indeed, the combination of the workman and the man of science that forms the civil engineer. The man of science may be formed independently of the workshop, but it is through the workshop alone that the man of science can become what the men (Brindley, Smeaton, Telford, and Rennie) I have enumerated were."

Speaking of the consequences of ignorance, Mr. Hosking says:—"He who drives piles where planking or even a layer of concrete may be sufficient,—who puts straps and bolts upon his carpenter's work where judicious framing of the timbers would have rendered such auxiliaries useless, and where they may be, but that he does not know it, altogether unnecessary,—who loads the ground with piers, and walls and piers with arches, containing larger quantities of brickwork or masonry than the service to be performed by them requires,—is guilty of fraud; and no man offering himself and accepting employment as an Architect or Civil Engineer can avoid such guilt, or the danger of being involved in the still greater crime of constructing the works intrusted to him in such a manner as to endanger human life, unless he knows what the arts of construction can do for him, and how to direct their application in detail."

In the following words, the professor alludes to his own qualifications for the office he assumes.

"Having spent nearly four years in learning to labour with my own hands in actual constructions which involved most of the handicrafts employed by the engineer and architect, I may, perhaps, be less willing to consider such an occupation of time as degrading to a student, and the more especially as I daily feel the value of such occupation in my own practice."

From such a man, bred in the school of practice, we might naturally expect that no indulgence would be shown to the idea of making engineers in a college: he says:—"In promising you information and instruction that will be useful to you in the pursuit of your professions respectively, I must beg to be understood not to promise to qualify you here to practise as Architects or as Civil Engineers."

We are not prepared, however, to concur in the architectural origin which Mr. Hosking attributes to engineering, and we think also that he lays too much stress on the architectural qualifications. He is, however, a man who will do honour to King's College, and help to maintain that institution in its genuine position of the first engineering school in the country. By the bye, how is it there is a Regius Professor of Engineering in the University of Glasgow, where there is no faculty, and in the University of London there is none?—*Railway Magazine.*

MISCELLANEOUS.

Thames Haven Railway.—We are glad to hear that some large and influential coal owners are regarding with so favourable an eye this undertaking, that there is every prospect of its being speedily brought to a successful completion.

Southampton and its Prospects.—Under this name a pamphlet has been published, which forcibly calls attention to the rising prospects of Southampton from the docks and railway. We coincide with the author in anticipating for that town a new era of prosperity.

Sir Isambard Mark Brunel.—It is with great satisfaction that we learn that her Majesty has been pleased to confer the honour of knighthood on the elder Brunel. This is pleasing on two accounts; first, as it is a proper tribute to the merits of that able man; and next, as it is a compliment to his profession. We hope that it is a prelude to greater liberality, for with the exception of Sir James Mac Adam's baronetcy, and the knighthoods of Sir John Rennie and Sir Mark Brunel, the engineers have had to complain of great neglect. Engineering is the only profession which is thus neglected, although the merits of its professors cannot be denied. What honour have they received for the railway system, by which we are placed in such an honourable position in the eyes of European nations?

Polytechnic Institution.—The managers of this Institution, who seem ever on the alert to add to its interesting attractions, have lately given a new feature to the oxyhydrogen microscope. After the usual microscopical phenomena, a series of picturesque representations are introduced, in which each representation gradually dissolves, and appears to resolve itself into its successor, which has all the appearance of naturally growing out of it, however different, or even opposite in its nature. Thus the transitions of a cottage in the depth of winter, bleak and bare, with every portion covered with snow, is resolved, by insensible gradations, into the same cottage, glowing in all the luxuriance of a summer verdure. The transitions from moon-light to sun-rise are equally natural and pleasing; but the two transitions which appear to give the most pleasure, are the resolution of a beautiful representation of the old Royal Exchange of London before the fire, through all the awful grandeur of the conflagration, to its ruinous state after the fire; and secondly, the resolution of two enemy's ships, engaged with a British man-of-war, from their pomp and pride to a shattered mastless state, with the British colours flying upon them after they had been conquered.

Patent Bude Light.—Coal gas, after it has undergone a novel and most effectual process of purification, is the principal material now used; its illuminating powers being increased by an equally novel and ingenious apparatus for obtaining oxygen from atmospheric air, instead of the more tedious and expensive process of obtaining it from manganese—precluding also the necessity of a second pipe. This light can consequently be supplied to the public with as much facility as common gas, the purifying machines and the other apparatus not being larger or occasioning greater inconvenience than the gas meters placed in private houses by the gas Companies, who must be also benefited in proportion to the increased quantity of their gas, which these improvements will cause to be introduced into certain classes of houses and apartments where it has never been heretofore admitted. Its great economy, is proved by the House of Commons being lighted by it, with greater satisfaction to the members of the house, and for a much smaller sum than had ever been paid, for either wax lights, oil, or any other light tried there: the nightly cost of the 276 wax candles, with which the house had been previously lighted, being £6 10*s.*, whereas it is now lighted at a nightly expense of only 12 shillings, and by only two lights for the body of the house, and two smaller ones for the galleries.

Hartlepool Central Railway.—A plan and preliminary prospectus of a new railway has just been published, the object of which is to open out to those coal fields, now about to be worked in the eastern and southern part of the county, a cheap and ready communication with Hartlepool, as well as to connect the collieries of the Auckland district by a direct railway communication with the same port. The line commences at the Bishop Auckland, and terminates on the Hartlepool Railway, at the 2¼ mile post from the Hartlepool Docks. The length of the line is 18½ miles. As it does not interfere with the privacy of the resident nobility and gentry, and as it is calculated to be of immense benefit to the coal owners and the public generally, there is no doubt of its complete success.—*Hull Advertiser.*

Sheffield, Ashton-under-Lyne, and Manchester Railway.—Last week, a bed of coal, of a good quality, was found in the tunnel now very fast progressing, at the summit of this railway.—This circumstance will, no doubt, be of considerable advantage to the Company, and we trust we may congratulate the Shareholders on their good fortune.—*Sheffield Iris.*

Canal Navigation.—Hitherto the suspension of trade on all canals, when covered with ice of a very trifling thickness, was considered unavoidable; but it has now been satisfactorily established by the plan adopted on the Forth and Clyde canal during the late storm, that the obstruction, so far from being insuperable, can be completely remedied. The Canal Company, and the traders on the canal, are indebted for this improvement to the ingenuity and persevering exertions of Mr. Robert Wilson, one of the overseers, by whom the plan was proposed and carried into execution. The object was effected by means of strongly constructed ice-breakers. By the plan adopted during the late frost, the extraordinary sight of fleets of twenty vessels attached to ice-breakers, and drawn by sixty horses, was daily to be seen passing along the Forth and Clyde canal, through ice from six to ten inches in thickness, at the rate of two miles an hour; and the extent of the benefit conferred on the trade is illustrated by the fact, that in many instances vessels which were towed by the ice-breaker from Port Dundas to Grangemouth, made their voyages to London, Hull, and Newcastle, returned with a new cargo to Grangemouth, and were taken back along the canal by the ice-breakers to Port Dundas, during the continuance of a single frost. The importance of this subject to all owners of and traders on canals is so great as to call for the utmost publicity, in order that the improvement may be generally adopted throughout the country.—*Glasgow Argus.*

Metropolitan Wood Paving.—The specimen in Coventry-street has been finished, and presents an evenness of surface which promises to rival the beautiful paving at Whitehall and in Oxford-street.

Dublin and Kingstown Railway.—The first locomotive steam-engine ever constructed in Ireland has been just completed by this enterprising and public-spirited company. It was tried on Saturday, and has been found in every respect to equal the most sanguine expectations of its projectors. It is a fact which redounds highly to the credit of Mr. Richard Pim, chief engineer of the Company, and his assistants, that the first moment the steam was let on, she moved off the building frame perfectly fit for work, not requiring the slightest alteration in valve, screw, crank, or cut; in general, more than one or two days are occupied in perfecting and adapting the various complexities of these beautiful and mechanical combinations. This new engine has been named the *Princess.* The works of the Company where this engine was built are amongst the most interesting of the "lions" of Dublin. No one unacquainted with such an establishment can visit them without being astonished and instructed.

New Steam Navigation Company.—We see by a proof of a prospectus, that a Company is in progress for running iron steam ships, on Mr. Holmes's plan, from this country to the United States.

Discovery of a Coal Field in France.—A wonderful discovery has just been made in the south of France. It consists of a coal field of 100 square leagues (600 sq. m.) in extent. The coal obtained from this mine is found to be superior to the coal produced from the most celebrated collieries in existence. The south of France, Africa, Italy, Spain, and even Great Britain, will derive considerable advantage from this discovery, and the trade of the Mediterranean will be benefited by it to an incalculable extent.—*National.*

LIST OF PATENTS.

Continued from page 72.

(SIX MONTHS FOR ENROLMENT.)

James Tildesley, of Willenhall, Stafford, factor, and Joseph Sanders, of Wolverhampton, lock manufacturer, for "improvements in locks."—Sealed March 29.

George Evans, of Dorset Place, Marylebone, for "an improvement or improvements upon trusses for the relief of Hernia."—Sealed March 29.

Alexander Parkes, of Birmingham, for "certain improvements in the production of works of arts in metals by electric deposition."—Sealed March 29.

John Lindsey, of Lewisham, esq., for "improvements in covers for water closets, night stools, and bed pans."—Sealed March 29.

James Furnival, of Warrington, currier, for "an expeditious mode of unhairing, mastering, and tanning various descriptions of hides and skins."—Sealed March 30.

Thomas Gore, of Manchester, machine maker, for "certain improvements in machinery or apparatus for roving, spinning, and doubling cotton, silk, wool, and other fibrous materials."—Sealed March 30.

John Oram, of Chard, in the County of Somerset, machinist, for "improved machinery or apparatus for making or manufacturing netted fabrics."—Sealed March 31.

William Jenkinson, of Salford, machine maker, for "certain improvements in machinery for preparing and spinning flax, silk, and other fibrous substances."—Sealed March 31.

Joseph Gaury, of Watling Street, warehouseman, for "a parachute to preserve all sorts of carriages using axletrees from falling or injuring upon the breaking of their axletrees," being a communication.—Sealed March 31.

John George Bodmer, of Manchester, engineer, for "certain improvements in the construction of screwing stocks, taps, and dies, and certain other tools or apparatus or machinery for cutting and working in metals."—Sealed April 3.

James Ogden, of Manchester, cotton-spinner, and Joseph Grundy Woolland, of Manchester aforesaid, commission agents, for "certain improvements in looms for weaving."—Sealed April 3.

William Edward Newton, of Chancery Lane, civil engineer, for "certain improvements in the process, mode, or method of making or manufacturing lime, cement, artificial stone, and such other compositions more particularly applicable for working under water, and in constructing buildings and other works which are exposed to damp," being a communication.—Sealed April 3.

Zacharia Bryant, of the Town of Nottingham, machinist, for "an improved method of manufacturing cloth and other fabrics from woollen, cotton, flax, silk, and other substances."—Sealed April 3.

James Anderson, of Newcastle-upon-Tyne, engineer, for "improvements in windlasses."—Sealed April 5.

William James Barsham, of Bow, Middlesex, gent., "for improvements in fastening buttons and other articles on to wearing apparel and other descriptions of goods or manufactures."—Sealed April 5.

Henry M'Evoy, of Graham Street, Birmingham, hook and eye maker, for "improvements in fastenings for bands, straps, and parts of wearing apparel."—Sealed April 5.

Jonathan Beilby, of York, brewer, for "improvements in brewing."—Sealed April 5.

William Hutchinson, of Sutton-on-Trent, seed crusher, for "certain improvements in the manufacture of oil-cake and seed-cake."—Sealed April 5.

William Littell Tizard, of Birmingham, brewer, for "certain improvements in apparatus for brewing."—Signed April 5.

Joseph Wilson Nuttall, of Belper, Derby, draper, and Henry Holden, of the same place, tailor, for "improved apparatus to be attached to trowsers, commonly called trowser straps."—Sealed April 5.

Joseph Apsey, of Cornwall Road, Lambeth, engineer, for "improvements in the construction of flues for steam boilers and other furnaces."—Sealed April 6.

Christopher Edward Dampier, of Ware, gent., for "improvements in weighing machines."—Sealed April 15.

Frank Hills, and George Hills, of Deptford, manufacturing chemists, for "certain improvements in the manufacture of sulphuric acid, and carbonate of soda."—Sealed April 15.

Henry Augustus Wells, of Saint John's Wood, gent., for "certain improvements in the manufacture of woollen cloths."—Sealed April 17.

Peter Kendall, of Clifford's Hall, Suffolk, Esq. for "an improved method or methods of connecting and disconnecting locomotive engines and railway carriages."—Sealed April 17.

Joseph Barker, of Regent Street, Lambeth, artist, for "improvements in measuring æriform or fluid substances."—Sealed April 20.

Joseph Bentham, of Bradford, for "improvements in weaving."—Sealed April 22.

Henry Brown, of Codnor Park Iron Works, Derby, iron manufacturer, for "improvements in the manufacture of steel."—Sealed April 22.

Thomas Harris, of Hales Owen, Birmingham, horn button manufacturer, for "improvements in the manufacture of what are called horn buttons, and in the dies to be used in the making of such description of buttons," being partly a communication.—Sealed April 22.

Humphrey Jefferis, of Birmingham, button maker, for "improvements in the manufacture of buttons."—Sealed April 22.

John Rostron, of Edenfield, Lancaster, manufacturer, and Thomas Welch, of Manchester, manufacturer, for "certain improvements in looms for weaving."—Sealed April 22.

Floride Heindryckx, of Fenchurch Street, engineer, for "certain improvements in the construction and arrangement of fire-places and furnaces applicable to various useful purposes."—Sealed April 24.

Lancelot Powell, of Clydach Works, Brecon, iron-master, and Robert Ellis, of Clydach aforesaid, agent, for "certain improvements in the manufacture of iron."—Sealed April 24.

Thomas Robinson, of Wilmington Square, gent., for "improvements in drying wool, cotton, and other fibrous materials in the manufactured and unmanufactured state."—Sealed April 27.

William Petrie, of Croydon, gent., for "a mode of obtaining a motive power by voltaic electricity, applicable to engines and other cases where a moving power is required."—Sealed April 27.

Alexander Southwood Stocker, and Clement Heeley, both of Birmingham, manufacturers, for "certain improvements in patten and clog ties, and other articles or fastenings of dress."—Sealed April 27.

Benjamin Rankin, of College Street, Islington, gent., for "a new form and combination of and mode of manufacturing blocks for pavement."—Sealed April 27.

Osborn Reynolds, of Belfast, Ireland, clerk, for "improvements in paving streets, roads, and ways."—Sealed April 27.

André Dronot de Charlieu, of Coleman Street Buildings, gent., for "improvements in preparing matters to be consumed, in obtaining light, and in the construction of burners for burning the same," being a communication.—Sealed April 27.